MALCOLM PIRNIE

MALCOLM PIRNIE, INC.
INDEPENDENT ENVIRONMENTAL ENGINEERS, SCIENTISTS & CONSULTANTS

April 5, 2005

Ms. Alice Yeh
Remedial Project Manager
U.S. Environmental Protection Agency - Region 2
290 Broadway, 19th Floor
New York, NY 10007

Re: Draft Quality Assurance Project Plan
Lower Passaic River Restoration Project Superfund Site

Dear Ms. Yeh:

Enclosed are two (2) copies of the Draft Quality Assurance Project Plan (QAPP) and Draft Field Sampling Plan (FSP), Volume 1 for the Lower Passaic River Restoration Project. Hard copies of this document have been distributed as directed and an electronic version of this document will be posted on PREmis. Copies of the Draft Work Plan will be submitted later this week under separate cover.

We appreciate the opportunity to work with you. Please call me at (201) 398-4365 if you have any questions.

Very truly yours,

MALCOLM PIRNIE, INC.

Bruce Fidler, P.E.
Project Manager

enclosures

c: Bill Sy, USEPA
Beth Buckrucker, USACE-KC
Scott Nicholson, USACE-NY
Tim Kubiak, USFWS
Ella Fillipone, Passaic River Coalition
Betsy Barrows, Battelle
John Logigian, MPI
Earl Hayter, USEPA
Peter Weppler, USACE-NY
Anne Hayton, NJDEP
Lisa Baron, NJDOT-OMR
Jim Fitzpatrick, HydroQual, Inc.
Len Warner, MPI

Lower Passaic River Restoration Project

Draft
Quality Assurance Project Plan

April 2005

PREPARED BY:
Malcolm Pirnie, Inc.
104 Corporate Park Drive
White Plains, NY 10602

FOR:
US Environmental Protection Agency
Region II

US Army Corps of Engineers
Kansas City District
Contract No.
DACW41-02-D-0003

DRAFT

QUALITY ASSURANCE PROJECT PLAN

LOWER PASSAIC RIVER RESTORATION PROJECT

Prepared by:

Malcolm Pirnie, Inc., in conjunction with Battelle and HydroQual, Inc.

April 2005

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Includes sections required by USEPA QA/G-5, March 2001

FIGURES

TABLES

ATTACHMENTS

1.0 PROJECT MANAGEMENT

This Quality Assurance Project Plan (QAPP) is developed to address the quality assurance and quality control (QA/QC) elements for the Lower Passaic River Restoration Project. It details the planning processes for collecting data and describes the implementation of the QA and QC activities developed for this program. The purpose of this QAPP is to generate project data that are technically valid and legally defensible.

The QAPP consists of four main components:

- Project Management.
- Measurement and Data Acquisition.
- Assessment and Oversight.
- Data Validation and Usability.

The above components will incorporate QA/QC requirements cited within the following documents:

- U.S. Environmental Protection Agency (USEPA) Requirements for Quality Assurance Project Plans, USEPA QA/R-5, March 2001.
- USEPA Guidance for Quality Assurance Project Plans, USEPA QA/G-5, December 2002.
- USEPA Guidance for the Data Quality Objectives Process, QA/G-4, August 2000.

1.1 DISTRIBUTION LIST

A hardcopy of the QAPP will be distributed to the following persons:

- Alice Yeh, USEPA, Region 2.
- Bill Sy, USEPA, Edison Laboratories.
- Earl Hayter, USEPA National Exposure Research Laboratory.
- Beth Buckrucker, U.S. Army Corps of Engineers – Kansas City District (USACE-KC).
- Peter Weppler, U.S. Army Corps of Engineers – New York District (USACE-NY).

- Scott Nicholson, USACE-NY.
- Anne Hayton, New Jersey Department of Environmental Protection (NJDEP).
- Tim Kubiak, United States Fish and Wildlife Service (USFWS).
- Lisa Baron, New Jersey Department of Transportation, Office of Maritime Resources (NJDOT-OMR).
- Ella Fillipone, Passaic River Coalition.

An electronic copy of the QAPP will be posted on the Passaic River Estuary Management Information System (PREmis), an internal project website described further in Section 2.9.1 – Non-Direct Measurements: Historical Data, to allow the project team and/or individuals associated with the project access to the latest version of this document. The final QAPP will also be posted to the public website, www.ourPassaic.org.

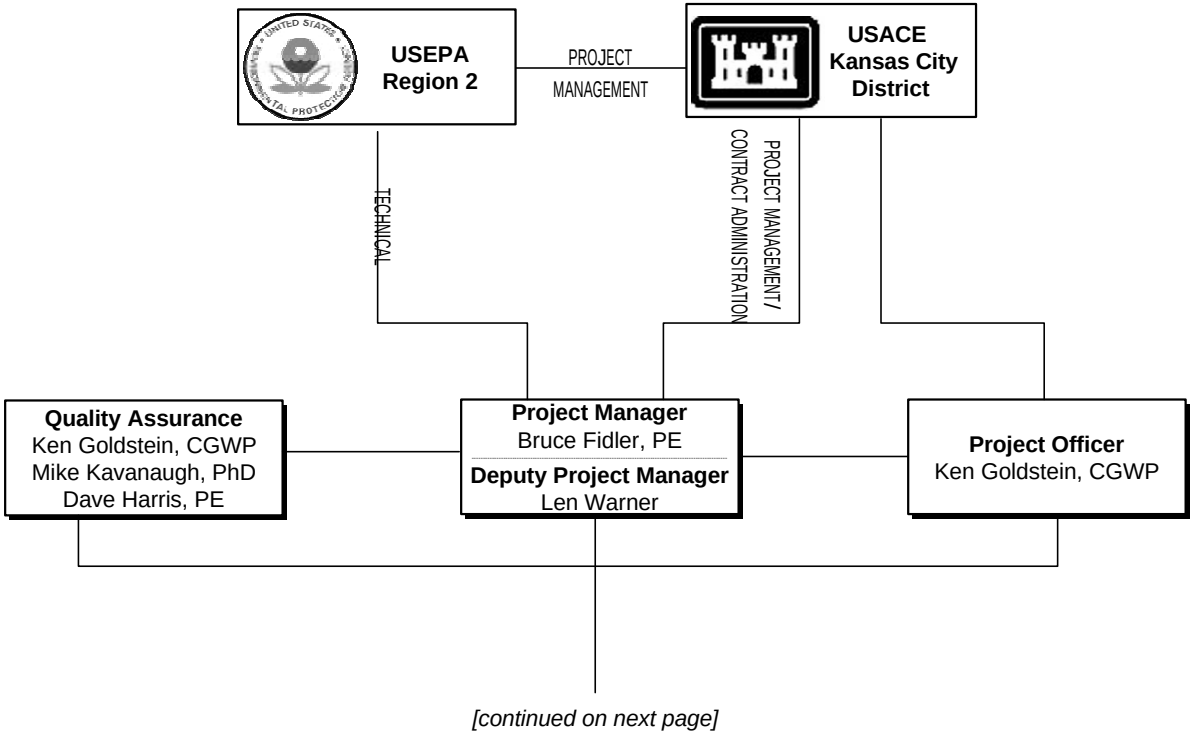
1.2 PROJECT/TASK ORGANIZATION

1.2.1 Overview

The project management team (see Figure 1) will consist of representatives from USEPA Region 2, USACE-KC, USACE-NY, NJDOT-OMR, Malcolm Pirnie, Inc. (MPI), HydroQual, Inc., Battelle, and TAMS, *an Earth Tech company*. The USEPA Region 2 is the lead agency and will provide project management. The USACE-KC will provide contract management and technical guidance. MPI will be the primary contractor and will be responsible for developing and implementing the investigation and will provide project management to the other subcontractors.

1.2.2 Project Management Structure

This section contains a description of the project organizational structure. Alice Yeh is the USEPA Project Manager with responsibility for the Passaic River project. Beth Buckrucker is the USACE-KC Project Manager, Lisa Baron is the Project Manager representing the NJDOT-OMR, and Scott Nicholson is the Project Manager representing the USACE-NY.

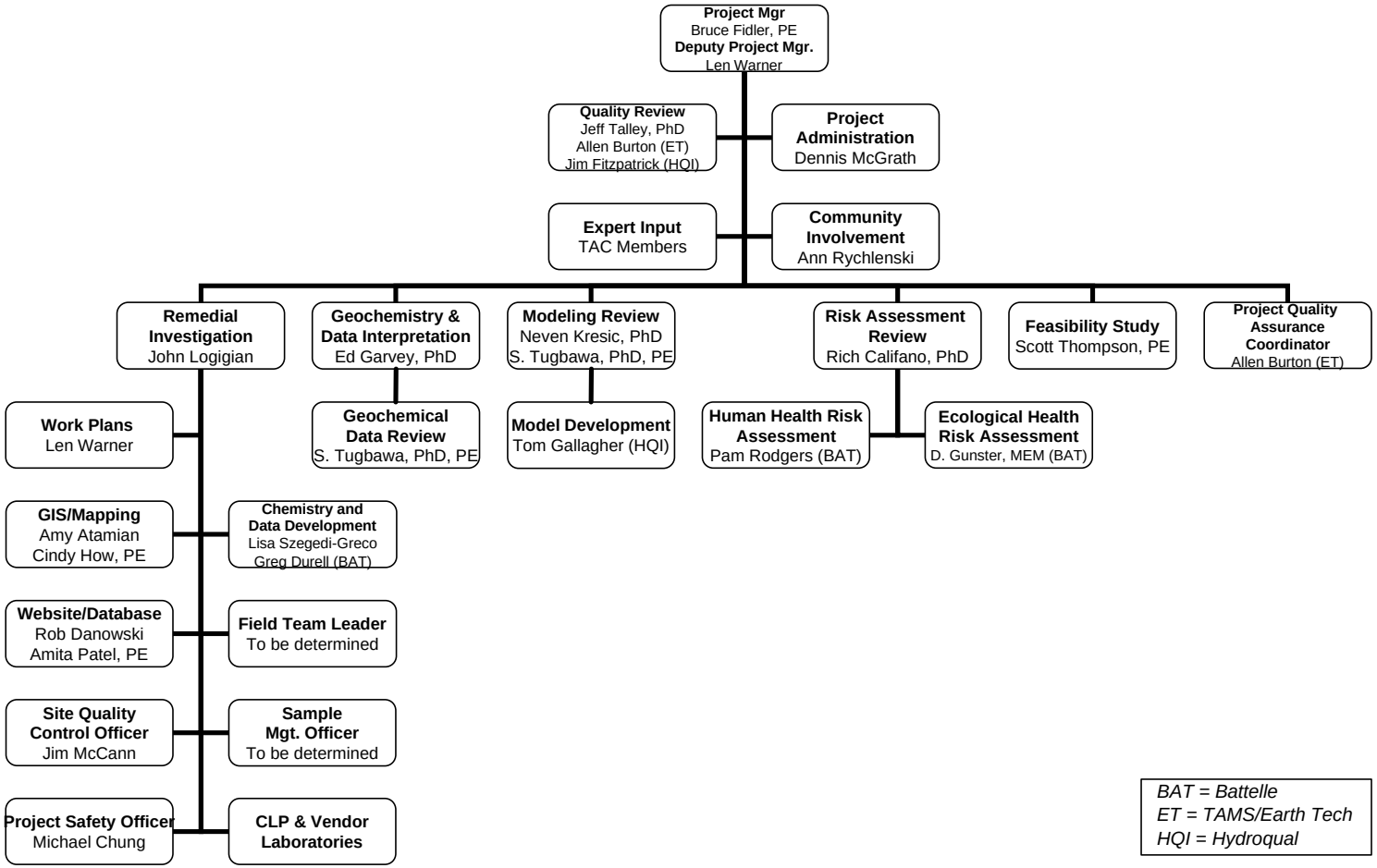


[continued on next page]

Lines of Communication between USEPA, USACE, and Malcolm Pirnie

MALCOLM PIRNIE	**Figure 1:** Lower Passaic River Restoration Site Project Team Organization Chart	Draft QAPP April 2005

Subject to Attorney Client, Work Product, Deliberative Process, and/or Joint Prosecution Privileges; FOIA/OPRA Exempt



Lines of Communication between Malcolm Pirnie, Battelle, HydroQual, TAMS/EarthTech, Technical Advisory Committee

MALCOLM PIRNIE

Figure 1: Lower Passaic River Restoration Site Project Team Organization Chart (cont'd)

Draft QAPP
April 2005

assessment (RA), and feasibility study (FS) work. As part of this responsibility, he will:

- Provide overall technical direction for preparation of work plans and technical memoranda, as well other tasks performed under this contract.
- Lead the activities of the project team and the subcontractors.
- Maintain budget and schedule surveillance and ensure timely submission of deliverables.
- Communicate directly with USEPA, USACE, and stakeholders.
- Approve reports and material for release to USACE and other external agencies.
- Oversee subcontractor performance.
- Allocate resources and staffing to implement the project work.

- Len Warner, Deputy Project Manager (DPM), reports directly to, and works with, the MPI PM. As delegated, the DPM is responsible for interacting with the USEPA and USACE PMs, project team members, subcontractors, and the stakeholders to ensure that the project is completed according to plan and in a timely manner. The DPM is responsible to the PM for the logistics of project activities such as:
  - Preparing reports/products.
  - Coordinating office and field activities.
  - Timely submission of deliverables.
  - Scheduling activities.

- John Logigian, Field Investigation Leader, will be the MPI contact person for all activities related to conducting the RI. As such, he will be responsible for:

- Providing technical support to Battelle for the RA.
- Coordinating with USEPA and USACE, as appropriate.

- Solomon Gbondo-Tugbawa and Neven Kresic will be the primary MPI contact persons for all activities related to producing the hydrodynamic model. As such, they will be responsible for providing technical review of the HydroQual modeling activities.

- Scott Thompson, FS Leader, will be the MPI contact person for all activities related to conducting the FS. As such, he will be responsible for:
  - Evaluating data being collected.
  - Brainstorming the remediation options.
  - Providing feedback to the program based upon his findings and the data needs of the remediation options being considered.

1.2.3 Quality Control Team Structure

QC for the project will be provided by several QC personnel including the Site Quality Control Officer (SQO), quality reviewers, the project quality assurance coordinator (QAC), and the technical advisory committee (TAC). Members of this Quality Control Team (QCT) are independent of the project team personnel. The roles and responsibilities of each QCT member are described below.

- Quality Reviewers: Neven Kresic, Jeff Talley, and Allen Burton have been identified as quality consultants for the project. They will provide technical guidance and quality review to the project team and will review project plans and deliverables.

- Developing and maintaining project QA files for the retention of sampling, monitoring, and field QA records.
- Participating in QA audits and conducting TSAs.
- Recommending changes to the PM to improve the effectiveness of the project in attaining its QA objectives for field, sampling, and monitoring activities.
- Making sure that the planning documents are being followed.
- Reviewing proposed additions and changes to this QAPP.
- Reviewing deliverables for technical content and quality objectives.
- Interfacing with the Contract Laboratory Program (CLP) via the Regional Sampling Coordination Control (RSCC) and subcontract laboratories, as well as data validators.

- Allen Burton, QAC, is responsible for monitoring the work being conducted for all programs [Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Water Resources Development Act (WRDA)] involved in this project. As such, he will be responsible for:
  - Reviewing project plans so that data collected for the various programs is comparable, useful to the majority of the entities involved, and collected in a format that is compatible with PREmis.
  - Reviewing the Field Sampling Plan (FSP) Volume 1 (MPI, 2005a) and Volume 3 (2005b) for applicability of the field sample collection methods (*e.g.*, filtered vs. non-filtered, time-weighted composites vs. grabs), what field data will be recorded in the field laptop (*e.g.*, sediment type, portion of the tidal cycle), sample frequency, depth, and spatial distribution, and applicability of the analytical methods.
  - Reviewing the QAPP for applicability of analytical methods, holding times, QC and response check requirements for the field and laboratory instruments; detection limits, action limits, and reporting limits; validation requirements;

Bolstering the credibility of technical work conducted for the project.

1.2.4 Field Team Members

- Mark McGowan, Certified Industrial Hygienist (CIH), Certified Safety Professional (CSP), Corporate Health and Safety Manager, serves as the administrator of the Corporate Health and Safety program. He is accountable directly to MPI's President for project health and safety concerns and is responsible for:
  - Proper training for MPI field personnel.
  - Overseeing the MPI medical monitoring program.
  - Providing guidance on interpretation of exposure monitoring data.
  - Determining levels of protective equipment.
  - Evaluating compliance with the Health and Safety Plan (HASP) Core Document and task-specific addenda through regular audits of field activities.
  - Approving the HASP and any task-specific addenda.

- Michael Chung, Project Safety Officer (PSO), reports directly to MPI's Corporate Health and Safety Manager. The PSO will have access to any personnel or subcontractors, as necessary, to resolve health and safety problems, and he will have the authority to stop work when that work appears to jeopardize safety. The PSO is responsible for identifying and prescribing appropriate protective measures. The PSO is responsible for:
  - Preparing the site-specific HASP Core Document and task-specific addenda.
  - Performing periodic health and safety audits.
  - Checking that health and safety procedures are observed in the field.
  - Monitoring personnel exposure to chemical toxins.
  - Developing emergency response procedures.

- Mobilizing the necessary equipment and personnel to conduct the work.
- Making sure that the planning documents are properly followed, including the standard operating procedures (SOPs).

- Members to be determined, a Field Activity Team, will be assembled from a qualified pool of personnel for each field event. The Field Activity Team is led by the Field Team Leader. The team is responsible for:
  - Performing their assigned field sampling activities (as directed by the Field Team Leader).
  - Make sure that the planning documents are properly followed, including the SOPs.

- To be determined, Sample Management Officer (SMO), is tasked with the care and custody of environmental samples collected for the project. The SMO is responsible for:
  - Maintaining custody of the samples and making sure the proper documentation of their transport to the laboratories.
  - Checking sure that the sample bottles are correctly labeled and the chain-of-custody (COC) forms and sample tags are properly filled out.
  - Maintaining project SMO files including COCs and bill of lading.
  - Making sure that the samples are properly preserved and custody sealed.
  - Checking that the samples are properly bagged and packed to minimize the potential for cross-contamination.
  - Coordinating sample delivery and receipt with the laboratory(s).
  - Coordinating with the CLP and subcontractor laboratories to arrange for shipment of the samples.

field data collection, and provide additional technical support as needed.

- Risk Assessment: Battelle is responsible for conducting the ecological and human health RA. Battelle is also responsible for providing additional technical support as needed.
- Laboratory Analysis: To be determined. These laboratories will be responsible for the analysis of samples for non-CLP parameters and/or media.
- Boat and Coring Services: To be determined. The on-water sediment coring services subcontractor(s) will be responsible for mobilizing all required equipment and personnel to the site, positioning over coring locations, core collection, handling, preservation, and delivery to the field office(s). The location and riverbed elevation of all core samples will be determined by the subcontractor using global positioning system (GPS) equipment.
- Data Validation Services: To be determined. This subcontractor will be responsible for validating all of the non-CLP data as well as any CLP data that exceeds RSCC's capacity [mainly polychlorinated biphenyl (PCB) and dioxin data]. They will also be responsible for writing validation reports and data usability reports, as well as making data changes and marking data qualifiers on the EDD module on PREmis.

1.3 PROBLEM DEFINITION/BACKGROUND

The Passaic River surface water and sediments are contaminated with a variety of chemicals including dioxins/furans, PCBs, organic pesticides, polycyclic aromatic hydrocarbons (PAHs), and inorganics such as mercury and lead. The contaminated sediments underlying the Passaic River are of concern to various federal and state regulatory agencies because they can have:

- Ecological health effects.
- Human health effects.

- Economic impacts on navigational dredging disposal costs.

The problem definition, site background and historic information are fully described in the Work Plan (WP) (MPI, 2005c). Sections 1 (Introduction), 2 (Site Background), and 3 (Preliminary Evaluation) of the WP (MPI, 2005c) summarize the history of the Study Area, evaluation of historical sediment data, and the preliminary Conceptual Site Models (CSMs). The CSM identifies the sources and mechanisms of potential contamination release within the Study Area and the possible pathways whereby human and ecological receptors may be exposed to sediment contaminations. The CSM will be updated based on ongoing hydrodynamic studies and analysis of historical geochemical data. Figure 2 provides a map of the Study Area.

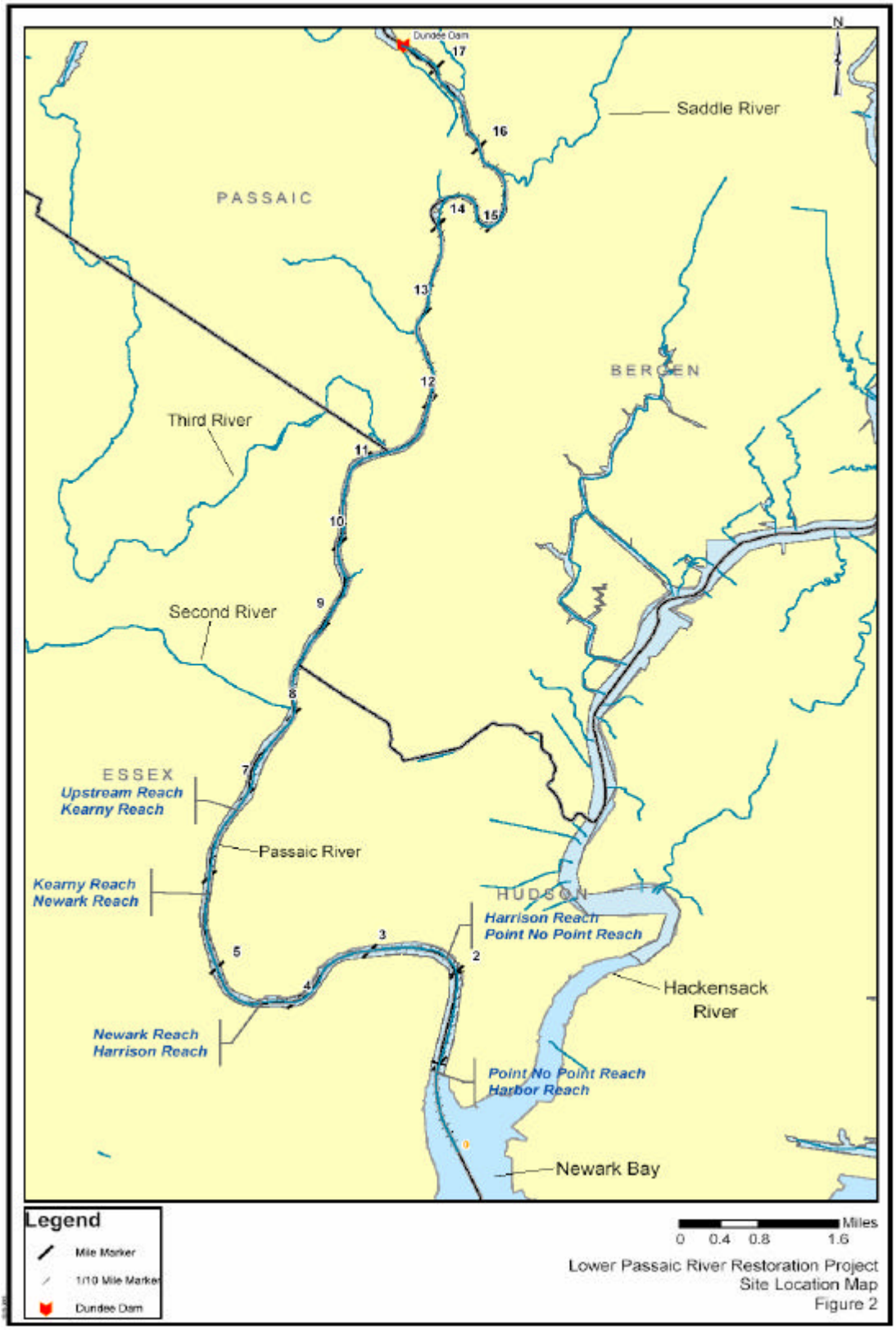


Figure 2: Lower Passaic River Study Restoration Project – Site Location Map

1.4 PROJECT/TASK DESCRIPTION

1.4.1 Task Description

The project will include the sampling and analysis of sediment, surface water and biota for water quality, wet chemistry, geotechnical parameters, and physical properties as well as chemicals of potential concern (COPCs) and chemicals of potential ecological concern (COPECs). The sampling and analysis of sediment, surface water and/or biota described in this QAPP and subsequent amendments will center primarily on the lower 17 miles of the Passaic River and its tributaries, but will also extend, as appropriate, into connected water bodies such as the Hackensack River and its tributaries, Newark Bay, Arthur Kill, and the Kill van Kull.

A full description of the project tasks are given in the WP (MPI, 2005c). Planned sampling activities are fully described in FSP Volume 1 (MPI, 2005a), FSP Volume 2 (in 2006), and FSP Volume 3 (MPI, 2005c).

1.4.2 Work Schedule

Water and sediment samples will be collected during the summer and fall of 2005. The sampling program will continue into 2006 and will expand to include the collection of biota samples. A detailed project schedule is posted on PREmis under the "Project Management" header, and the "Schedule" sub-header. The project schedule is updated regularly (*e.g.*, monthly) based on discussions with the project team members [*i.e.*, USACE, USEPA, NJDOT-OMR, and subcontractors], as well as on seasonal and weather considerations with respect to field sampling activities. The analytical laboratory requirements for the 2006 sampling events (including biota programs), will be revisited based following review of the data collected during the 2005 sampling events.

1.5 QUALITY OBJECTIVES AND CRITERIA

This section discusses the performance, measurement, and acceptance criteria for all data to be collected for this project. As such, it includes the following sections:

- DQOs.
- Project action levels (ALs) and reporting limits (RLs) for the parameters of interest.

- A discussion of precision, accuracy, representativeness, completeness, and comparability (PARCC).
- QC Samples.

1.5.1 Project Data Quality Objectives

The overall QA objective is to develop and implement procedures for field sampling, chain of custody, laboratory analysis, and reporting that will provide results that are scientifically sound and can be used to make defensible decisions. In this section, the QA objectives that are required for the data collected during the Lower Passaic River Restoration Project are developed and specifically identified. The DQO process, which is a systematic planning process, takes into consideration the intended use of the data, the procedures available for laboratory and field analysis, and the resources available. The end result of this process is the development of quality requirements for each data collection activity. The DQOs for the project are documented in Attachment 1.1. Based upon these DQOs, analytical methods that are capable of supporting the DQOs were selected (Refer to Section 2.4 – Analytical Methods). The QA objectives for the analytical methods were also determined (Refer to Section 2.5 – Quality Control).

The historical data evaluations, geochemical evaluations, and field sampling programs described in the WP (MPI, 2005c) and FSP Volume 1 (MPI, 2005a), Volume 2 (in 2006), and Volume 3 (MPI, 2005b) are designed to address the problem statement and Fundamental Questions presented in Steps 1 through 2 of the DQOs. The problem statement from DQO Step 1 is summarized below as four primary objectives:

- Prepare the CERCLA Remedial Investigation/Feasibility Study report for the Lower Passaic River Restoration Project.
  - What are the contaminants of potential concern (COPCs) and potential ecological concern (COPECs)?
  -
  - What are the quantitative human and ecological health risks posed by the contamination?
  - Are the human health and ecological risks posed by the Study Area unacceptable (*i.e.*, the risks exceed the risk range identified in the National

Contingency Plan) and do they warrant assessment of remedial action via a Feasibility Study?

  - What is the comparative performance of the remedial alternatives, based on the CERCLA evaluation criteria?
  - What are the relative risk reductions associated with the various remedial actions in relation to the baseline risks?

- Support a comprehensive, watershed-based plan to restore the functional and structural integrity of the Lower Passaic River ecosystem and to support broader, watershed-wide restoration efforts under WRDA.
  - How should candidate restoration sites be prioritized for ecosystem rehabilitation, based on the "screening criteria" described in the FSP Volume 3 (MPI, 2005b)?
  - What is the appropriate restoration plan for suitable candidate sites?
  - What are the viable alternatives to reduce contaminant loading in the Harbor and improve dredged material management for the navigational dredging program?
  - What other WRDA projects are appropriate, feasible, and cost-effective?
- Support development of a natural resource damage assessment (NRDA) under CERCLA to provide restoration for natural restoration for natural resources injured by contamination and to compensate for the public's lost use of those resources.
  - Which of the public's natural resources are injured by the contaminants discharged by the responsible parties, and how much is injured?
  - What is the pathway of the contaminants from their release to the injured resources?
  - What is the appropriate type and amount of restoration needed to restore injured resources and compensate the public for their lost use?

The problem statement is modified by the following Fundamental Questions developed to guide the project effort:

1. If we take no action on the River, when will the COPCs and COPECs recover to acceptable concentrations?[1]
2. What actions can we take on the River to significantly shorten the time required to achieve acceptable or interim Risk Based Concentrations (RBCs) for human receptors and ecological receptors?

1: With "acceptable" as a determination of whether COPCs pose unreasonable risk to human health (based on cancer risks between 1E-06 and 1E-04, and noncarcinogenic health effects based on a hazard index greater than 1), and whether COPECs pose unreasonable risk to ecological health (based on an ecological risk hazard index greater than 1).

3. Are there contaminated sediments now buried that are likely to become "reactivated" following a major flood, possibly resulting in an increase in contaminants within the fish/crab populations?
4. What actions can we take on the River to significantly improve the functionality of the Lower Passaic River watershed?[2]
5. If the human and ecological risk assessments for Newark Bay demonstrate unacceptable risks due to export of contaminants from the Passaic River, will the plan proposed to achieve acceptable risks for Passaic River receptors significantly shorten the time required to achieve acceptable or interim RBCs for human and ecological receptors in Newark Bay, or will additional actions be required on the Passaic River?[3]
6. What actions can we take on the River to significantly improve navigation dredge material quality in the New York/New Jersey Harbor?

The Fundamental Questions address major issues associated with the DQOproblem statement. For example, Questions 1 and 3 are pertinent to the evaluation of a Monitored Natural Recovery (MNR) alternative, in that they address sediment stability issues and the duration for MNR to reach acceptable contaminant concentrations. In addition, Question 4 addresses WRDA issues that are to be considered along with the CERCLA effort.

1.5.2 Accuracy, Precision, and Sensitivity of Analysis

To measure and control the quality of analysis, certain QA parameters are defined and utilized in data analysis activities. These parameters are defined below. The QA/QC required for the parameters to be analyzed under the USEPA CLP is contained in the sections of the USEPA CLP Statement of Work (SOW). The required QA/QC for the non-CLP laboratory test methods including the frequency, reporting limits, and required actions to be taken if QC criteria are not met are given in laboratory statements of work in Attachment 3. Detailed information on the CLP methods and QA/QC criteria can be found in the USEPA CLP SOW found on the USEPA CLP website at http://www.epa.gov/superfund/programs/clp/.

2: With "significantly" requiring policy input
3: Note that this question is a shared one with the RI/FS for the Newark Bay OU since the actual benefits of such reduction will need to be jointly determined; DQOs lay out the appropriate limits of investigation for the Study Area.

Precision

Precision measures the reproducibility of data or measurements under specific conditions. Precision is a quantitative measure of the variability of a group of data compared to their average value. Duplicate precision is stated in terms of relative percent difference (RPD). Measurement of precision is dependent upon sampling technique and analytical method. Field duplicate and laboratory duplicate samples will be used to measure precision for project samples. Both sampling and analysis will be as consistent as possible. For a pair of measurements, RPD (or absolute difference) will be used, as presented below:

$$RPD(\%) = \frac{|D_1 - D_2|}{\left[\frac{(D_1 + D_2)}{2}\right]} \times 100$$

where: D_1 and D_2 = the two replicate values.

The upper limit for precision in sediment duplicates is 100 percent RPD (in accordance with USEPA Region 2 data validation criteria for inorganics) for analytes present at five times the sample quantitation limit.

Accuracy

Accuracy measures the bias in a measurement system. Sources of error include the sampling process, field contamination, preservation, handling, shipping, sample matrix, sample preparation, and analysis technique. Sampling accuracy will be evaluated through the results of equipment blanks, while analytical accuracy will be assessed through surrogate spike, matrix spike, laboratory control and/or quality check samples. In general, accuracy is measured in terms of percent recovery (%R).

$$\%R = \frac{(SSR - SR)}{SA} \times 100$$

where: SSR = spike sample result
SR = sample result
SA = spike added from spiking matrix

Refer to Attachment 3 and the CLP SOW for the laboratory analytical method accuracy requirements.

Representativeness

Representativeness expresses the degree to which data accurately and precisely reflect a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative parameter that is dependent upon the proper design of the sampling program and proper laboratory protocol. The sampling network created for this project was designed to provide data representative of site conditions. During the development of the sampling network, consideration was given to the past history of contamination in the Study Area, existing analytical data, physical setting, and processes. The rationale used in developing the sampling network is discussed in detail in the FSP. Representativeness will be satisfied by determining that the FSP is followed, proper sampling techniques are used, proper analytical procedures are followed, and holding times for the samples are not exceeded in the laboratory.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. It is expected that the laboratories used for this project will provide data meeting QC acceptance criteria for 90 percent, or more, of all samples analyzed. Following the completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$\text{Completeness}\,(\%) = \frac{(\text{number of validated data})}{\text{number of sample collected for each parameter analyzed}} \times 100$$

The completeness acceptance criterion for samples collected in the field will be 95% of the quantity of samples planned for collection in the FSP. Corrective action will

be implemented to re-collect samples where necessary and possible (*e.g.*, sample jars broken during shipment).

Comparability

Comparability expresses the confidence with which one data set can be compared with another. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data are expected to provide comparable data. It should be noted that the majority of the historical data was collected approximately 10 years ago. Due to advances in analytical instrumentation and methodology, it is likely that analyses being performed as part of this project will utilize methodologies that were not available at the time the historical samples were analyzed.

1.5.3 Desired Method Sensitivity

This section discusses measurement performance criteria and desired method sensitivity. Depending on the use of the data, specific RLs will be required for each parameter. To establish RL requirements, certain terms must first be defined.

- Method Detection Limit (MDL): The MDL is the concentration of a particular compound that can be detected by a particular method. The concentration must be greater than zero and the compound must be detected with at least a 99% confidence level. The laboratory MDL must be low enough to support the reporting limit for the test parameter.
- Quantitation Limit (QL): The QL is the concentration that can be reliably achieved within specific limits for precision and accuracy.
- Reporting Limit (RL): The RL is the lowest concentration reported for a specific compound in a sample after corrections have been made for dilution factors, weight (for solid samples), and percent moisture. It should be noted that RLs are highly dependent on matrix effects. A calibration point needs to be included at least a low as the RL.

Attachment 2 contains a compilation of representative human health and ecological risk based ALs for the COPCs/COPECs identified in the PAR. The ALs were compiled and evaluated as the basis for the required RLs.

For the water and sediment sampling scheduled for 2005, the majority of the chemistry inorganic and organic test data will be obtained through the USEPA CLP. The

USEPA CLP has extensive quality assurance requirements and the data will be technically sound. The required sample quantitation limits for these data will be based upon the USEPA CLP capabilities. Under the CLP flexibility clause, lower quantitation limits will be requested to address the risk assessment requirements of the project. After the first phase of sampling planned for 2005 is completed, the data collected will be evaluated and it will be determined if it is necessary to investigate more specialized methods with potentially lower quantitation limits for subsequent data acquisition activities.

Laboratory RLs for tissue have not been included at this time, since tissue samples will not be collected during the phase of sampling planned for the summer and fall of 2005. RLs for tissues will be included in a future revision/amendment of the QAPP.

Tables 2-1 through 2-6 list the laboratory target RLs for the chemical analyses of sediment and water samples which will be collected during 2005 and that will be tested through USEPA CLP. These tests include dioxins/furans, PCB (Aroclors), target compound list (TCL) volatile organic compounds (VOCs), TCL semivolatile organic compounds (SVOCs) including PAHs, TCL pesticides, and Target Analyte List (TAL) metals and cyanide. Table 2-7 lists the target RLs for PCB Congeners based upon method 1668A, but current plans are to obtain this analysis from a non-CLP laboratory. The required laboratory RLs and the quality requirements for the non-CLP laboratory tests, listed in Tables 2-7 and 4-1 through 4-5, are given in the SOWs in the two draft laboratory Task Orders which are presented in Attachment 3.

The RLs presented in the QAPP were selected to address the risk assessment, modeling and engineering requirements of the project in a technically sound and reasonable manner. The target RLs (given in Tables 2-1 through 2-7 and Attachment 3) were generally selected to be at or below the lowest risk assessment AL for the COPCs/COPECs, as shown in Attachment 2. For some parameters, such as dioxin/furans, PCBs, and several PAHs and pesticides, it was necessary to base the reporting limits on the quantitation limits achievable by the available laboratory methods, rather than ALs.

1.6 SPECIAL TRAINING AND CERTIFICATIONS

Any specialized training requirements necessary to complete the project will be documented to ensure that the specific skills have been obtained, verified, and updated as necessary.

1.6.1 Training

Required training will be documented for all personnel, including sub-contractors, performing functions such as data validation. The Equipment Manager will have training as described in Section 2.6.1 – Preventative Maintenance and Instrument Calibration – Field Instruments. Specific health and safety training needs, such as training mandated by Occupational Safety and Health Administration (OSHA) regulations, training for shipping hazardous materials mandated by the Department of Transportation (DOT), and training for navigating vessels mandated by the United States Coast Guard (USCG) and/or others will be complied with and will be specified within the Project HASP.

1.6.2 Certification

Training and certification will be obtained, wherever necessary, for personnel prior to their involvement in the field sampling activities. No person will be allowed to perform tasks that require specific training without the respective current certification on file. These certifications will be documented and scanned into the project database (PREmis).

1.7 DOCUMENTS AND RECORDS

Requirements for the storage of documents and records can be found in the QCP. PREmis, an internal project database, was developed to collect, store, manage and report all information gathered during the Lower Passaic River Restoration Project. PREmis is a centralized, web-based portal to the various forms of electronic information collected and stored for this project. Refer to Section 2.9.1 – Non-Direct Measurements – Historical Data for a more a detailed description of PREmis. Public information is uploaded from PREmis to the public website, www.ourPassaic.org.

Records of both raw and processed data generated on samples submitted to subcontract laboratories must be kept on file by the laboratory. The laboratories' data record keeping procedures must be documented in the laboratory quality manual.

Further details concerning the project Documents and Records requirements are also discussed in Section 2.10 on Data Management.

2.0 DATA GENERATION AND ACQUISITION

This group of quality elements addresses measurement system design and implementation, including appropriate methods for sampling, analysis, data handling, and QC documentation.

2.1 SAMPLING PROCESS DESIGN (EXPERIMENTAL DESIGN)

Environmental sampling includes the collection of surface water, sediment, biota, soil, and groundwater samples; several geophysical, water quality, and sediment transport surveys will also be performed. Project sampling and field documentation procedures, as well as the objectives of each sample task, are provided in detail in the Lower Passaic River Restoration Project WP (MPI, 2005c) and FSP Volume 1 (MPI, 2005a), Volume 2 (in 2006), and Volume 3 (MPI, 2005b). This QAPP will be revised once Volume 2 is issued. The purpose of the FSP is to ensure that samples are collected, handled, and documented correctly prior to analysis. See Section 5 (Field Investigation Tasks) of the WP (MPI, 2005c), Section 3 (Field Tasks) of FSP Volume 1 (MPI, 2005a) and Section 3 (Field Tasks) of FSP Volume 3 (MPI, 2005b) for a listing of sampling activities, media to be sampled, types of analyses to be performed, and the number and location of samples to be collected. Attachment 1.2 summarizes the proposed sample design described in the FSP Volume 1 (MPI, 2005a). It includes a list of project data needs, the associated data user (*e.g.*, geochemist, modeler, engineer and/or risk assessor), the sampling program designed to meet each data need, media to be sampled, and the test parameters desired.

2.2 SAMPLING METHODS

The sampling procedures for sediment cores and surface water samples are provided in detail in the Lower Passaic River Restoration Project WP (MPI, 2005c) and FSP Volume 1 (MPI, 2005a). Section 2.3 – Sample Handling and Custody, further discusses sampling requirements.

2.3 SAMPLE HANDLING AND CUSTODY

Sample custody procedures ensure the timely, correct, and complete analysis of each sample for all parameters requested. A sample or evidence file is considered to be in someone's custody if it:

- Is in his/her possession;
- Is in his/her view, after being in his/her possession;
- Is in his/her possession and has been placed in a secured location; or
- Is in a designated secure area.

Sample custody documentation provides a written record of sample collection and analysis. The sample custody procedures provide for specific identification of samples associated with an exact location, the recording of pertinent information associated with the sample, including time of sample collection and any preservation techniques, and provide a COC record which serves as physical evidence of sample custody. Custody procedures will be similar to the procedures outlined in the USACE's Requirements for the Preparation of Sampling and Analysis Plans (USACE, 2001) and the USEPA's Contract Laboratory Program Guidance for Field Samplers (USEPA, 2004a). The COC documentation system provides the means to individually identify, track, and monitor each sample from the time of collection through final data reporting. Sample custody procedures are developed in three areas: sample collection, laboratory analysis, and final evidence files, which are described below.

2.3.1 Field Sample Handling and Custody

Field records provide a means of recording information for each field activity performed at the site. Chain of custody procedures document pertinent sampling data and all transfers of custody until the samples reach the analytical laboratory. The sample packaging and shipment procedures summarized below will ensure that the samples arrive at the laboratory with the chain of custody intact. Refer to SOP No. 10 in Attachment 4 on Sample Management. SOP No. 11 in Attachment 5 covers sample preservation procedure instructions. Tables 3-1 through 3-6 list the specific sample preservation requirements for each test method and sample matrix.

2.3.2 Field Procedures

a) The field sampler is personally responsible for the care and custody of the samples until they are transferred to the SMO or until they are properly dispatched. As few people as possible should handle the samples.

b) The Field Team Leader, or designee, is responsible for entering the proper information in the field laptop at each sample location, including all pertinent information such as sample identification number, method of sample collection, date and time of sample collection, type of analysis, tracking number (for split samples) and description of sample location. Refer to the FSP for more detail regarding the laptop field application. The information entered into the field laptop will be transmitted via wireless technology to the PREmis database; this information will be used to generate an electronic COC.

c) All sample bottles will be labeled with the project code, sample number, matrix, type of analysis required, and preservation requirements.

d) The samples will be properly preserved, bagged, and packed into coolers. SOP No. 11 in Attachment 5 contains the proper preservation techniques. The COC form will be placed into the lead cooler, and the coolers shipped to the laboratory.

e) The SQO will review all field activities to determine whether proper custody procedures were followed during the field work and to decide if additional samples are required.

2.3.2.1 Field Records

Refer to the FSP for the procedure on documenting field activities. The field laptop will provide the means of recording data collection activities. Entries will be described in as much detail as possible so that persons going to the site can reconstruct a particular situation without reliance on memory. At the beginning of each day, the date, start time, weather, names of all sampling team members present and level of personal protection being used will be entered. The names of visitors to the site and the purpose of their visit will also be recorded. All field measurements as well as the instrument(s) used (including the instrument's assigned Passaic project barcode, located on the back of all field equipment) will be noted.

Samples will be collected following the sampling procedures documented in the FSP. The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume collected, associated rinsate blanks, and number of containers. Observations such as sampling conditions or any problems will also be recorded. Sample identification numbers will be assigned prior to sample collection. Field duplicate samples, which will receive a unique

sample identification number, are "blind" to the laboratory and will be identified under the sample description so that they can be associated with their respective samples by project staff. Matrix Spike (MS)/Matrix Duplicate (MD), and MS/Matrix Spike Duplicate (MSD) samples will also be noted, but do not receive unique sample identification numbers.

2.3.2.2 Sample Identification

The documentation system for laboratory samples will be based on the sample documentation system described in USACE (USACE, 2001) and USEPA (2004) guidance documents. Sample identification procedures are also described in the FSP. All samples collected will have a label that contains the following information:

1. Project name and/or number.
2. Field ID or sample station number.
3. Designation of sample as grab or composite.
4. Sample matrix.
5. Sample preservation notes.
6. Analytical parameters.

2.3.3 Chain of Custody Procedure

At the time of sampling, an electronic COC form will be generated by PREmis based on the information entered into the field laptop. The COC form used will be equivalent to the CLP COC. If a laboratory specific COC form is used for the subcontract laboratories, it must contain the same information as the CLP form. The following information will be recorded on the COC form (note that most of this information will be filled in by PREmis when the COC is generated; the signatures will be in ink).

1. Project name and/or project number.
2. Signature of SMO or designee.
3. Sampling station number.
4. Date and time of collection.
5. Grab or composite sample designation.
6. Sample matrix.

7. Sampling location description.
8. Field identification number.
9. Analyses required.
10. Preservation technique.
11. Signatures and dates for transfers of custody.
12. Air express/shipper's bill of lading identification numbers.

The COC form serves as an official communication to the laboratory detailing the particular analyses required for each sample. The COC record will accompany the samples from the time of sampling through all transfers of custody. It will be kept on file at the laboratory where samples are analyzed and archived. Three copies of the COC form are created; one copy is retained by the Field Team Leader and two are sent to the laboratory. The SMO or designee completes a COC record to accompany each shipment from the field to the laboratory. The completed COC is put in a zip-lock bag and taped to the inside cover of the sample shipping container. The container is then sealed with custody seals and custody is transferred to the laboratory.

2.3.4 Transfer of Custody and Shipment

The custody of samples must be maintained from the time of sampling through shipment and relinquishment to the laboratory. Instructions for transferring custody are given below:

1. All samples are accompanied by a COC. When transferring custody of samples, the individuals relinquishing and receiving will sign, date, and note the time on the COC. This form documents sample custody transfer from the SMO or designee, through the shipper, to the analytical laboratory. Since a common carrier will usually not accept responsibility for handling COC forms, the name of the carrier is entered under "Received by", the bill-of-lading number is recorded in the comments section, and the COC form is placed in a zip-lock plastic bag and taped to the inside lid of the lead shipping cooler.
2. Samples will be packaged for shipment and dispatched to the appropriate laboratory via overnight delivery service. SOP No. 10 in Attachment 4 contains the proper sample packaging techniques. A separate COC record must accompany each shipment. Shipping containers will be sealed for shipment to the laboratory. Two custody seals will be applied to each cooler to document that the container was properly sealed and to determine if the container was tampered with during shipment. The custody seals will be placed on the coolers in such a manner that the custody seal

would be broken if the cooler were opened (*i.e.*, diagonally opposite corners of the cooler lid).

3. The original COC (and a copy for CLP laboratories) will accompany the shipment. A copy will be retained by the Field Team Leader.
4. If the samples are sent by common carrier or air freight, proper documentation must be maintained. For example, the bill of lading must be retained by the Field Team Leader.

2.3.5 Laboratory Custody Procedures

The laboratory custody procedures will be equivalent to those described in the latest edition of the CLP SOW. The following will be addressed in the laboratory custody SOPs:

- A designated sample custodian accepts custody of the samples and verifies that the information on the sample labels matches that on the COC. The sample custodian will document any discrepancies. The sample custodian will sign and date all appropriate receiving documents. The sample custodian will also document the condition of the samples upon receipt at the laboratory. An example Sample Receipt checklist is given in Attachment 6. The CLP laboratories will send a copy of the sample receipt checklist to USEPA's RSCC, while the subcontract laboratories will fill out the form electronically on PREmis.
- Once the samples have been accepted by the laboratory, checked and logged in, they must be maintained in accordance with laboratory custody and security requirements.
- To ensure traceability of samples while in the possession of the laboratory, a method for sample identification that has been documented in a laboratory SOP will be used to assign sample numbers.
- The following stages of analysis must be documented be the laboratory
  - Sample Extraction/Preparation
  - Sample Analysis
  - Data Reduction
  - Data Reporting
- Laboratory personnel are responsible for the custody of samples until they are returned to the sample custodian.
- When sample analyses and QA checks have been completed in the laboratory, the used portion of the sample must be stored or disposed of in accordance with the protocols specified in the CLP SOW or the subcontract agreement. Identifying labels, data sheets, COCs, and laboratory records will be retained until analyses and QA checks are completed in accordance with the protocols specified in the CLP SOW or the subcontract agreement.

2.3.6 Final Evidence Files

This is the final phase of sample custody. The COC records and sample analysis request form copies are archived in their respective project files. Laboratory custody forms, sample preparation and analysis logbooks, and data packages will become part of the laboratory final evidence file. Other relevant documentation including records, reports, and correspondence, logs, pictures, and data review reports will be archived by MPI.

2.3.7 Sample Holding Times

Information on sample holding times and preservations for each test method and matrix are given in Tables 3-1 through 3-6. If sediment samples are frozen at the time of collection for this project the holding times will begin after the sample is defrosted.

2.4 ANALYTICAL METHODS

All samples collected during field sampling activities for the Lower Passaic River Restoration Project will be analyzed either through the USEPA CLP program or through the procurement of subcontract laboratories. For non-CLP parameters, the analysis will be performed by laboratories qualified in the analytical methods and, where applicable, certified through the following:

- National Environmental Laboratory Accreditation Program (NELAP);
- NJDEP;
- National Oceanic and Atmospheric Administration (NOAA) National Status and Trends (NS&T);
- USEPA CLP – Qualified Laboratory; and/or
- USACE.

When possible the test methods selected were either USEPA methods or national consensus methods, such as those published by ASTM, or in Standard Methods for the Examination of Water and Wastewater. A tiered analytical testing approach will be used for the project, dependent upon the type of sample being collected. This means that the RL and level of QC for a particular parameter will vary depending on the use of the data.

For example, lower RLs and a higher level of QC will be required for samples used to delineate the vertical and horizontal extent of contamination than for samples known to be collected within a hot spot. The analyte groups and analytical methods to be used for the studies on samples of sediment and water planned for the summer and fall of 2005 are given in Tables 4-1 through 4-5. The analytical methods for tissue samples are not given since the tissue samples will not be collected until 2006. The analytical methods appropriate for required tissue analysis will be included in a revision to the QAPP.

The following is a description of the techniques proposed for the key laboratory analytical methods. Depending on the capabilities of laboratories chosen to support the project, modifications may be made to the specific test methods and quality assurances described, so long as the data quality is sufficient to meet project objectives and with the approval of the SQO.

2.4.1 Inorganic Methods

The analysis for individual metals in water and sediment for the phase of the project planned for 2005 will performed by the methods described in the Laboratory Statement of Work for the USEPA (2004b) CLP Multi-Media, Multi-Concentration, Inorganic Analytical Services for Superfund (ILM05.3 or Draft ILM06.X or the latest version). TAL metals reported under this program include aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, thallium, vanadium, and zinc, plus cyanide. In addition, titanium is also being requested under the CLP flexible clause, since it was identified as a COPC/COPEC.

Analytical techniques used are fully described in the statement of work and include Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES) and ICP-Mass Spectrometry (ICP-MS). Total mercury will be determined by Cold Vapor Atomic Absorption (CVAA). Total cyanide will be measured in water and sediment by a colorimetric method described in the CLP SOW.

Metal concentrations in sediment will be screened employing rapid analysis by X-Ray Fluorescence (XRF) at parts per million (ppm) levels. Accelerated turnaround of metals analysis is also available though USEPA CLP analytical service via rapid metals analyses by ICP-AES, which will also be useful.

Selected water and sediment samples, as described in FSP Volume 1 (MPI, 2005a), will also be analyzed for trace metals and metals species including: methyl mercury; arsenic, arsenic III, and arsenic V; and chromium VI by the methods listed in Table 4-1 and the Lab Task Orders in Attachment 3. These test methods are not offered by USEPA-CLP and will be provided by a qualified subcontract laboratory (to be chosen).

Methyl mercury in water and sediment will be determined by USEPA Method 1630, Methyl Mercury in Water by Distillation, Aqueous Ethylation, Purge and Trap, and cold vapor atomic fluorescence spectrometry (CVAFS) with sediment sample preparation by acid bromide/methyl chloride extraction.

Arsenic species (Total As, As III, and As V) in water and sediment will be measured by USEPA Method 1632 (USEPA 1998), Chemical Speciation of Arsenic in Water and Tissue by Hydride Generation Quartz Furnace Atomic Absorption Spectrometry, Revision A with modification to extract the arsenic species [As(III) and As(V)] from sediments.

Hexavalent chromium will be determined in the water and sediment samples by USEPA Method SW-846-7199 employing ion chromatography. Sediment samples will be prepared by USEPA Method SW-846-3060A.

2.4.2 Organic Methods

Methods for organic parameters are listed in Table 4-2. The USEPA CLP organics analytical services will provide methods for the isolation, detection, and quantitative measurement of TCL volatiles, semivolatiles, pesticides and Aroclor target compounds in water and sediment samples. Analytical techniques such as GC-MS-Selective Ion Monitoring (GC-MS-SIM) and GC-Electron Capture Detector (GC-ECD) will be employed. The analytical techniques are fully described in USEPA-CLP Statement of Work for Organic Analysis Multi-Media, Multi-Concentration, SOM01.4, October 2004 (USEPA, 2004c) or the most recent revision of the USEPA-CLP organic analysis service.

For this project, a tiered analytical approach will be available for dioxins/furans and PCB analyses including the use of screening methods as well as laboratory methods suited for different concentrations of the contaminants. The primary method for

determining dioxins/furans will be USEPA Method 1613B by High Resolution GC-High Resolution MS (HRGC-HRMS) which after extraction measures the isomers at pg/L (picograms/Liter) [parts per quadrillion (ppq)] levels in water and at ng/kg (nanograms/kilogram) [parts per trillion (ppt)] levels in sediment samples. USEPA 1613B analysis is available through the USEPA CLP. Samples taken from areas where analytical sensitivity is less important (*e.g.*, where higher levels of dioxins/furans are expected) may optionally be analyzed by USEPA Method 8280 by HRGC-Low Resolution MS (HRGC-LRMS), which can measure ng/L (nanogram/Liter) (ppt) levels in water and ug/kg (microgram/kilogram) [parts per billion (ppb)] levels in sediment samples. In addition, field screening for dioxin/furans may be conducted by a modified version of USEPA Method SW-846-4025.

PCB Aroclor analysis will be obtained through USEPA-CLP employing GC-ECD or GC-MS-SIM. Individual PCB congeners will be determined by USEPA Method 1688A by HRGC-HRMS at pg/L (ppq) levels in water and at ng/kg (ppt) levels in sediment samples. USEPA Method 1668A will at least initially be performed by a non-CLP subcontract laboratory. In addition, the modified Method 4025, also applicable for determining the dioxin Toxic Equivalency Quotient (TEQ) based upon Cape Technologies Kits, will be employed to screen sediment samples for PCB TEQ at 20 ppt. It will be possible to measure both the PCB TEQ on the same sediment extract used to determine dioxin TEQ.

Hydrocarbon VOC and SVOC data obtained through the CLP organic analyses will be used to screen for petroleum hydrocarbon contamination. In addition, samples collected from sites suspected of containing petroleum may also be tested for total petroleum hydrocarbons (TPH) by USEPA Method SW-846-8015. Analytical results will include those hydrocarbons within the C10 to C28 range.

Other organic analysis test methods that will be employed are listed in Table 4-2 and include analysis of water samples for butyltins, by GC, methane by GC, determination of total organic carbon (TOC) and dissolved organic carbon (DOC) by carbonaceous analyzer, and analysis for particulate organic carbon (POC). In addition, sediments will be tested for butyltins and TOC.

2.4.3 Radiochemistry

Radiochemistry analyses are being done for sediment dating purposes and will be performed by the methods provided in Table 4-4. Radon in water will be measured by Liquid Scintillation as described in Standard Method 7500-RnB. Radon analyses in water can potentially be used to assess ground water intrusion into the river. Radionuclides will be determined by Gamma Spectrometry and/or Alpha Spectrometry following the methods given in the Health and Safety Laboratory (HASL)-300 EML Procedures Manual and or USEPA-600 4-80-032.

2.4.4 Other Tests and Water Quality Parameter

Additional water quality tests will be performed on water column samples including total phosphate, orthophosphate, nitrogen (ammonia and Kjeldahl), sulfides, ammonia, chemical oxygen demand, biochemical oxygen demand, total dissolved solids, total suspended solids, volatile suspended solids, chlorophyll a, and pH. The associated methods are listed in Table 4-5.

2.4.5 Geochemistry – Engineering Tests

Sediment samples will be tested for engineering parameters including grain size, bulk density, shear stress and Atterberg Limits by the ASTM methods are listed in Table 4-5. In addition, sediment samples will be tested for Cation Exchange Capacity by SW-846-9081.

2.4.6 Immunoassay Screening for Dioxin TEQ and PCB TEQ

Immunoassay screening may also be performed for dioxin TEQ and PCB TEQ by a modified version of USEPA Method SW-846-4025, if arrangements can be made to implement the method in a suitable laboratory location. The method is available in a kit supplied by Cape Technologies. Copies of the Cape Technologies technical notes are included in Attachments 7 and 8. The procedure will provide a semi-quantitative estimate of both Dioxin TEQ and PCB TEQ at a 20 pg/g (ppt) reporting limit on a single sediment sample.

Requested laboratory turn-around times for the non-CLP test methods are given in the draft Laboratory Task Orders in Attachments 3.1 and 3.2. The data turn around requirement for the majority of analyses is within 35 days of receipt of the sample.

2.5 QUALITY CONTROL

To monitor the quality of the data generated for this project, an appropriate number of QC procedures will be employed for each measurement type. The employment of QC procedures permits the validation of the method and provides a measure of the ability of the particular system being used to meet the DQOs established for each measurement or analysis. Once the measurement or analysis has begun, the employment of QC procedures permits the monitoring of the system output for quality. The QC results, presented along with the reported data, allow the data to be assessed for quality and, with other factors, allow a determination to be made on how well the data have met the DQOs. In general, laboratory QC programs are more rigorous than field QC programs. The type and frequency of the individual QC for the analytical methods are given in the CLP SOW and the non-CLP SOW for each test method in Attachment 3.

2.5.1 Laboratory Quality Control

Both CLP and non-CLP laboratories will be required for this project. Procurement and tracking of these services will be conducted in accordance with the following memoranda:

- Procuring Analytical Services through the DESA Laboratory and the CLP. Robert Runyon, Chief Hazardous Waste Support Section. No date.
- Tracking Superfund Non-CLP Analytical Data (ANSETS): Directive # 9240.0-2C. Jennifer Feranda, CLP Project Officer and RSCC, Hazardous Waste Support Section. No date.
- Directive # 9240.0-2C: Tracking Superfund Non-CLP Analytical data, Michael B. Cook, Director, Office of Emergency and Remedial Response. November 14, 2002.

2.5.2 CLP Laboratory Quality Control

All samples being analyzed through USEPA's CLP program (TCL organics, TAL inorganics including cyanide, and dioxins/furans) will be analyzed following the QC methods described in the most recent CLP documents:

- USEPA Contract Laboratory Program, Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration (SOM01.0), Exhibit E: Quality Assurance/Quality Control Procedure and Requirements (USEPA, 2004c). October 2004 or the latest revision.

- USEPA Contract Laboratory Program, Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration (ILM05.3), OSWER Document 9240.1-43FS, USEPA Publication 540-F-04-001. February 2004 (USEPA, 2004b), Quality Assurance/Quality Control Procedure and Requirements or the current revision.
- USEPA Contract Laboratory Program, Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration (DLM01.4); Quality Assurance/Quality Control Procedure and Requirements or the latest revision.
- Multi-Media Dioxin and Furan Analytical Service for Superfund (DLM01.4), OSWER Document 9240.1-38FS USEPA Publication 540-F-02-007. September 2002.

2.5.3 Non-EPA-CLP Quality Control

For the non-CLP laboratories, an SOW will be developed that lists each analytical method along with the required RLs and QC. Refer to the QC tables in the Lab Task Orders in Attachments 3.1 and 3.2 for the minimum non-CLP laboratory QC requirements. The SOWs in these Lab Task Orders will be sent to all prospective laboratories. Any laboratory that bids on this work must demonstrate the ability to comply with these requirements. Current plans are to obtain PCB Congener analysis through a non-CLP lab. Suitable QC requirements are included in Attachment 3.1.

Subcontracting with the non-CLP laboratories will be a major acquisition, which is described in the Final QCP (February 2003) as requiring detailed source selection decision-making criteria. As such, prior to selecting any subcontract laboratories, certain minimum requirements must be met. Each laboratory will be selected based on an objective, qualifications-based evaluation prepared by MPI. The qualifications included in this evaluation may include, but are not limited to, the following:

- Documentation that the laboratory has the appropriate certifications/accreditations.
- An initial demonstration of capability is required from all laboratories for all applicable methods prior to analyzing environmental samples.
- Documentation that the laboratory has met the analytical method's specific performance criteria requirements.
- Documentation that the laboratory has conducted a determination of the method detection limit, as described by the analytical method and where appropriate.

- Each analyst must have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.
- Each laboratory must maintain a formal in-house QA/QC program to which they adhere.
- Each laboratory must demonstrate that they adhere to their own SOPs.
- The laboratory must demonstrate that that are able to meet the sample capacity and turn around time requirements.

MPI will monitor to determine that the laboratories are in compliance with the SOWs through the data validation process (refer to Section 4 – Data Validation and Usability, of this QAPP).

2.6 PREVENTATIVE MAINTENANCE AND INSTRUMENT CALIBRATION

When collecting field measurements or analyzing data, only calibrated instruments will be used. Instruments must be properly calibrated to produce technically valid data. Documentation of calibration and response check results verifies that the instruments used for measurement are in proper working order and the data produced are reliable. The calibration requirements described below are necessary to support the DQOs for this project. Calibration of field instruments will be documented in the field laptop and uploaded to PREmis.

The purpose of a preventative maintenance program is to keep the calibrated sampling, field testing, and analytical equipment working properly, confirm proper performance, avoid erroneous results, and minimize equipment downtime. The preventative maintenance program also provides for the documentation of all maintenance to be used as evidence of instrument maintenance and for scheduling future maintenance. The laboratory preventative maintenance program is the responsibility of the laboratory and only the minimum requirements are mentioned here.

2.6.1 Field Instruments

As described in the FSP, various instruments will be utilized to collect measurements while in the field. To confirm that equipment is working properly, and

avoid erroneous results, these instruments will be maintained under the preventative maintenance program described below:

- On at least an annual basis (if applicable), equipment will be calibrated by the manufacturer or other qualified facility. The calibration records will be maintained in the site files.
- At a minimum, instruments will have a battery and response check at the start of each day, before measurements are made, and at the end of each day, after all measurements are complete. Any response checks conducted by the field crew will be recorded in the field laptop and uploaded to PREmis. If the initial response check indicates a problem with the instrument, it will not be used in the field until the problem is corrected. If the end of the day response check indicates a problem with the instrument, the preceding sample results will be reviewed for validity and reanalyzed as necessary. Field calibration will be conducted at the interval recommended by the manufacturer.
- Minor service and repair will be done by the Equipment Manager, who is trained in the service and repair of field instruments. Equipment in need of major or more complex repair and services will be sent to the manufacturer or other qualified facility. All maintenance, servicing, and repair will be recorded and kept on file. Field personnel will record maintenance and instrument problems in the field laptop. The Equipment Manager will keep a record of all equipment released to the field and a record of all maintenance and service on file.
- Normal upkeep will be conducted daily after each use and includes inspecting for damage and signs of problems and will include, as appropriate:
  - Cleaning.
  - Lubrication of moving parts.
  - Check/change battery.
  - Inspect for damage.
  - Check for operation problems.
  - Inspect all hoses and lines.
- Information to be recorded during a field calibration or response check could include, as applicable, date and time, technician name, field calibration or response check procedure, response check results, problems, and instrument serial numbers.
- All calibration standards will be traceable to acceptable sources. Only personnel trained in the use of the field instruments will operate them.

The specific operation and maintenance of the field equipment to be used during the project is documented in the FSP. Note that the operation and maintenance program for the mooring equipment (Hydrodynamic/Sediment Transport Program) is different

than the program outlined above (refer to Attachment 4 to the FSP). The manufacturer's suggested maintenance program for the equipment is specified in the FSP.

If any of the equipment used for this project is rental equipment, it must be demonstrated that the rented equipment will be able to meet the DQOs of the data collection activity for which the equipment is being used. As a result, the equipment supplier will be required to provide adequate documentation of the accuracy, maintenance, and upkeep of the rented equipment that will enable the DQOs to be met.

2.6.2 Laboratory Instruments

The primary goal of the project laboratories' preventive maintenance programs will be to prevent instrument and equipment failure as much as possible and to minimize instrument downtime when failures occur. The laboratories selected will maintain an inventory of replacement parts needed for preventative maintenance and spare parts that routinely need replacement. Implementation and documentation of the preventive maintenance program will be the responsibility of the technical group using the instrument according to the individual policies in the Laboratory Quality Manual. If an instrument failure impedes sample analysis, the laboratory will notify the SQO of the problem so correction actions can occur, including sample capacity management.

2.7 LABORATORY INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

All samples collected for this project will be analyzed according to specific USEPA or other established procedures. The preventative maintenance and calibration procedures and frequencies for these analyses are detailed in each applicable analytical method. All calibration results will be received from the laboratory as part of the data package deliverable and they will be kept in the site file and verified as part of the data validation process. For the non-CLP laboratories, additional calibration information is referenced in Attachments 3.1 and 3.2, which contain the laboratory SOWs. The preventative maintenance activities, either preventative or repair, will be documented on standard forms or logbooks. Written procedures will include maintenance schedules, problem identification procedures, space for describing problems and repair notes, and

failure analysis protocols. Service contracts and regularly scheduled in-house maintenance will be included, along with a list of critical spare parts. In the event a piece of equipment breaks down for an extended period of time, the laboratory will have sufficient backup equipment to complete the analyses within holding time requirements.

2.8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

All supplies and consumables used for this investigation will be obtained through appropriate suppliers and will meet any applicable supply-specific requirements. All supplies and consumables will be inspected prior to use. Any product that does not meet applicable requirements will be returned to the supplier for replacement, or will be discarded. Supply-specific requirements include, but are not limited to, the following:

- Blank water will be certified analyte-free and analytical results will be provided for each lot.
- Decontamination and preservation chemicals will be ultra-pure grade or pesticide-grade, as applicable. Certifications will be obtained from the supplier.
- Sampling equipment will be constructed of approved materials.

2.9 NON-DIRECT MEASUREMENTS

There are several non-direct measurements that will be used during the investigation. These non-direct measurements, which include historical data for various media, atmospheric deposition measurements, hydrodynamic studies, and fresh water inflows, are discussed below.

2.9.1 Historical Data

Previously, electronic historical data were obtained from various sources and were uploaded to the PREmis database. Historical data and information on the Passaic River is also available on the public website www.ourPassaic.org.

The data sources are listed below:

- National Oceanic and Atmospheric Administration (NOAA).
- New York State Department of Environmental Conservation (NYSDEC).
- New York State Department of Health (NYSDOH).

- TAMS, *an EarthTech company* (TAMS).
- USACE.
- USACE-NY District.
- USEPA.
- Tierra Solutions Inc (TSI).
- USFWS.

The PREmis database, which contains over 300,000 available records, provides information on samples collected and analyzed for various chemical and non-chemical parameters. PREmis contains information beyond the Passaic River (such as the Hackensack River up to the Oradell Dam, Berry's Creek, Pierson Creek, Newark Bay, and the Arthur Kill and Kill van Kull). The chemical and physical parameters contained in PREmis can be grouped into the following classes: conventional and geotechnical, radionuclides, metals, PAHs, PCBs, pesticides/herbicides, dioxins/furans, SVOCs, VOCs, and TPH.

Because these data were collected by numerous entities for various uses, the quality of the data varies. A data quality scheme was established through a review of all the relevant historical data in PREmis to establish their relevance to the site, and assign data quality flags. A list of 45 attributes (data quality factors) that are the most useful in establishing data quality was compiled into a checklist to determine the quality of the data. Further details regarding the data quality screening process are discussed in the Technical Memorandum: Preliminary Data Quality Scheme – Passaic River Restoration Superfund Site (Battelle, 2004). In summary, the relevant studies within the study domain were assessed as acceptable for further analysis.

The major uses of the historical data are to develop a preliminary conceptual site model and to select a sampling design for future data collection to support geochemical, risk assessment, modeling, and engineering analysis;therefore, a detailed evaluation of the historical data is underway. This data evaluation will include:

- Determination of spatial distribution of contaminant concentrations in sediments and sediment physical characteristics
  - Mapping of contaminants to determine horizontal and vertical extent of contamination. This effort will provide information on data gaps for planning future sampling and modeling activities. An additional benefit of this analysis will be to identify the unique contaminant patterns of various regions of the river,

if present. This information may identify sources of contamination in each region and provide a basis to design focused sampling tasks to further identify the potential sources. In addition, this information provide a basis for planning investigations of sediment pore water concentrations, with the goal of understanding the role of diffusion and sediment bed flux in explaining water column concentrations.

  - Evaluation and analysis of the existing data, especially high resolution cores, to determine rates of sediment accumulation in various river areas and more important, to properly plan sediment core locations and sampling depths.
  - Spatial/geostatistical analysis to provide a statistically-based sampling design.
  - Analysis of existing sediment non-chemistry (physical) data – grain size, TOC, moisture content, Atterberg limits and other geotechnical parameters to provide information relevant to sampling design, risk assessment and engineering analysis.
  - Combine bathymetric information with sediment concentration to provide information on mudflat contamination levels. This will guide in selecting areas where direct human exposure is likely and additional sampling is required.

- Determination of the spatial and temporal patterns in water column concentrations
  - Evaluation of existing data on water column contaminant concentrations (in tributaries, within the tidal river and adjacent water bodies) and determination of spatial and temporal patterns that can be factored into the sampling program so as to maximize the program's value and avoid collecting marginally valuable samples.
  - Determination of the influence of tidal forcing, hydrological events and other factors to provide information on appropriate sampling frequency and techniques.

- Evaluation of current and historical bathymetry data.
  - Evaluation and analysis of additional historical data collected for the lower 6 miles from TSI (*e.g.*, 1999 and 2000 datasets), historical data for the upper 11 miles of river (1989), and current data collected by the USACE (2004). This evaluation will involve the preparation of transverse and longitudinal bathymetric cross-sections to provide information on geomorphological changes, areas of erosion and deposition, stability of sediments, stability of river banks. Determining this information will guide in determining appropriate sediment core locations and will serve as an initial step for future engineering analysis.
  - Evaluation and summarizing of existing geophysical data, including the TAMS 2004 Side Scan Sonar data collected for dredging pilot study, to provide support for further data collection in the river.

- Evaluation of contaminant levels in Biota – The contamination pattern in biota serves as an integrator of conditions within the river. Correlation of sediment, water and biota distributions can provide significant insights as to sources and the roles of sediment and water in determining biological exposure. These correlations can

provide guidance for the design and optimization of fish sampling as well as sediment sampling programs.

2.9.2 Atmospheric Deposition

Atmospheric deposition is the contribution of atmospheric pollutants or chemical constituents to land or water ecosystems. Atmospheric deposition loadings will be calculated based on data provided by the New Jersey Atmospheric Deposition Network (NJADN). The NJADN data were collected by researchers from Rutgers and Princeton Universities, with support from the Hudson River Foundation, New Jersey Sea Grant, and New Jersey Department of Environmental Protection. Up to four (4) NJADN stations were identified for application to model input:

- Liberty State Park – Applied to Harbor cores (*i.e.*, Hudson River below Haverstraw Bay, Upper Bay, Newark Bay, Arthur Kill and Kill van Kull, East River, Harlem River, Jamaica Bay).
- Sandy Hook – Applied to open water areas (*i.e.*, Lower Bay and New York Bight, Raritan Bay, Long Island Sound).
- New Brunswick – Applied to urban tributary areas (*i.e.*, Hackensack, Passaic, and Raritan Rivers).
- Chester – Applied to northern less urbanized areas (*i.e.*, Hudson River above Haverstraw Bay).

Some or all of these stations may be used to develop deposition over the open water areas. Atmospheric deposition loadings to the model used for the Study Area will use the available NJADN data for the following chemicals: total PCBs, PCB homologues, dioxin/furan congeners, PAHs, pesticides, and metals including mercury. Representative chemicals from these chemical classes will be chosen for inclusion in the model based on physicochemical properties as well as modeling efficiencies.

Currently, historical deposition fluxes for PCB homologues, gases, particles, and precipitation at each of the four stations are available from NJADN and may be applied directly to the model. For mercury and cadmium, historical gas, particle, and precipitation flux data are available from NJADN on a harbor-wide basis and these will be applied to the entire model domain. For dioxin/furan congeners, NJADN did not calculate fluxes, but provided historical gas and particle concentration measurements for

the Liberty State Park, Sandy Hook, and New Brunswick stations. NJADN protocols will be used to develop the concentration measurements into fluxes. The New Brunswick data will be applied to both urban and northern, less urbanized tributary areas since Chester data are not available for dioxin/furan congeners.

2.9.3 Fresh Water Inflows

The U.S. Geological Survey (USGS) maintains long term data of hydrologic discharges in the Passaic River at Little Falls and three tributaries: the Saddle River at Lodi, the Third River at Passaic, and the Second River in Belleville. Time series data of water inflow from these stations will be used to specify the discharge at boundary conditions. Because the upstream boundary of the study area is at the Dundee Dam, the data from Little Falls will be used to determine a relationship between river discharge at Little Falls and discharge data that will be collected at Dundee Dam during the monitoring program. This relationship will allow for the reconstruction of historical discharges at Dundee Dam.

2.9.4 Hydrodynamic Measurements

Rutgers University and the USGS are currently conducting a hydrodynamic study of the lower 6 miles of the Passaic River, particularly the Harrison Reach, to aid the N.J. Department of Transportation – Office of Maritime Research (NJDOT-OMR) and its partner agencies in the implementation of a pilot dredging study planned for 2005. During these studies, hydrodynamic parameters, including temperature, current, salinity, and depth, are monitored at fixed moored stations and during shipboard surveys under various river discharge and precipitation conditions. These measurements of the physical variables of interest within the modeling domain will be used in calibrating and validating the hydrodynamic model. More information on this effort is provided in the Hydrodynamic/Sediment Transport Work Plan (Attachment 4 to FSP Volume 1), since MPI is collecting data in concert with Rutgers University and the USGS.

2.10 DATA MANAGEMENT

This section describes the project data management process, tracing the path of the data from their generation to their final use or storage.

2.10.1 Field Data

Due to the magnitude and complexity of the sampling program, traditional field data collection methods (*e.g.*, handwritten field logbooks and data sheets) are impractical for this project. Therefore, PREmis, a centralized, web-based data management system, has been created. Data collection occurs on a Visual Basic application (developed in-house at MPI with a Microsoft Access database) that is downloaded onto a field laptop computer. As the field team collects information into the laptop, this information is transmitted via wireless technology to the project website. Refer to Attachment 9 for a memorandum describing security procedures for the field application. Once on the project website, the data are available to the project team members in a variety of formats such as:

- A Microsoft Access or Excel download.
- A report available for viewing on the website.
- On the live GIS map available on the website.
- A pdf download for site sketches.
- A thumbnail or download for digital site photographs.

The following section summarizes data collection from the field to the project website:

- First, a secure project website is established; this website is PREmis. Security on the website consists of secure socket layers (*i.e.*, https site), password protection, and multiple user levels. These user levels restrict access and rights to certain portions of the website.
- Prior to conducting field work, known information is entered onto selected pages of the website. For example, all of the field instruments [*e.g.*, Horiba, photoionization detector (PID)] are assigned a unique barcode identifier. Information for the equipment (*e.g.*, model, calibration date) is then entered into the project website on the equipment page.
- A calendar of field events (with a comments section) is created to assist the field team(s) with their work, and to ensure that all teams know and understand their sampling assignments. Work orders that specify where sampling is to occur, what parameters should be analyzed for, as well as any other pertinent information, are also created in the calendar.
- When the field team(s) begins work, each team is assigned a field laptop that has a specific identification number associated with it. When the field team launches the

field application, the user is prompted for their unique username and password. This way, the field application keeps a log of who entered in what information, along with the dates and times the information was entered. The purpose of this is twofold; this acts as each field team member's electronic signature and it also ensures that unauthorized users cannot access the software (*i.e.*, write in someone else's logbook).

- At the beginning of each new sampling event, the field team downloads a work order that is specific to that field team, from the project website to the field laptop. The work order contains that team's field assignment [*e.g.*, low resolution coring in the Passaic River between River Miles (RMs) 2 and 3], as well as information about previous sampling that occurred at this location. Each week, the field team also updates the background information associated with each work order (*e.g.*, equipment IDs) by downloading this information from the website.
- Instrument QC is entered directly into the system at the beginning and end of each day. If the response check indicates that the instrument is not working properly (*e.g.*, the PID response is greater than 2 ppm different from the standard gas concentration), the user is prompted to use a different instrument. This allows the field team to immediately identify if a problem is occurring, thus eliminating wasted field effort.
- When the field team begins collecting sampling information, they are required to fill in a series of information windows that consist of pick lists, comment fields, and automatically generated fields. For example, if a field team is collecting a chemical sediment sample, the field application, *not the field team*, assigns the sample ID. Since the sample ID also contains the unique identifier for the laptop from which it was requested, sample IDs are never duplicated. Another advantage is the elimination of missing information since certain fields must be filled in prior to moving to another window.
- As the field team collects field measurements and laboratory samples, the field application prompts them to collect QC samples (*e.g.*, duplicates, triplicates, MS/MSD, MS/MD, rinsates). Certain QC calculations for field measurements are built into the system. For example, when the field team collects a duplicate measurement with an instrument, the field application will calculate the RPD and determine if it falls within the required limits. If not, a message will appear on the screen warning the user to check the instrument.
- After the field team completes an information window and clicks the button labeled "Done," the information entered into the window can be viewed but it cannot be changed. This is analogous to the field team not being allowed to erase information once it's entered into the field logbook.
- All the information collected in this application is written to a secure password-protected Microsoft Access database accessible directly only by a database administrator. Since the database is secure, the field team is not able to make any changes to the records contained in it.
- Since the field application uses wireless technology, all information entered into the application is automatically uploaded to the project website. If there are any problems with the wireless system, the information is stored in the laptop until the

field team returns to the field office to upload the information to the project website. The field team prints out the field data collection report from the website, reviews the report, and initials and dates each page. Copies of this report are kept at the site field office under the field team leader's control

- Once the information is on the website, it is reviewed by the SQO or his designee. They can either accept or reject each piece of data. Until the SQO marks the data as reviewed and either approved, conditionally approved, or rejected, only personnel with the proper security level can view the data. The data can be viewed by the entire project team only after the SQO review is complete.
- During the SQO review and/or the field team's review of the report, it is possible that mistakes or omissions in the information will be noted. When this occurs, the field team is supplied with a paper form to fill out that requests either supplemental information or corrections to the data. This information is then added to the report by one of the site administrators. A complete paper record of the change and/or addition, the person requesting the correction, the person supplying the information, and the date of the change, is maintained in the site files.
- As described above, once the field data are collected, the information is uploaded from the field application to the project website. A module on the website allows the field team to select individual samples, create chain of custody forms, and mark the samples as shipped to the laboratory. Each chain of custody form is retained electronically on the system; a signed hard copy of the form is also retained in the site files, under control of the field team leader.

2.10.2 Laboratory Data

As described above, all data collected for this project will be stored electronically in PREmis. The following describes the process for managing data from the laboratory:

1. Once the field information is uploaded to PREmis, and approved by the SQO or designee, laboratory samples will appear on the data report. Prior to receiving data from the laboratory, these samples will be marked to indicate that laboratory data is outstanding.
2. All samples will be sent to the laboratory following the COC procedures detailed in this QAPP. Once the laboratory receives the samples, a module on the website allows them to mark each shipment as received. Any problems with the shipment such as broken custody seals or insufficient sample volume, are also marked on the website. Note that CLP laboratories will not be required to fill out the information on the website. They will supply RSCC with a sample receipt checklist; MPI will enter this information into the website.
3. The laboratories used for this project will utilize USEPA CLP or equivalent sample handling procedures. Each laboratory utilized for this project will be required to have a laboratory information management system (LIMS) capable of producing EDDs.

4. When the laboratory analyzes the samples, raw data is generated. This data, which can take the form of area counts or instrument responses, is processed by the laboratory as described in the analytical method, and converted into concentrations.
5. The laboratory then generates an EDD that contains a variety of information including, but not limited to the following. Note that the CLP laboratories will create a USEPA Multimedia EDD (MEDD) while the non-CLP laboratories will create an MEDD equivalent EDD.
   - Sample ID.
   - Chemical Abstracts Services (CAS) Number.
   - Preparation Method.
   - Analytical Method.
   - Cleanup Method.
   - Collection, Preparation, and Analysis Date.
   - Dilution Factor.
   - Percent Moisture.
   - Analyst Name.
   - Instrument ID.
   - Concentration.
   - RL and DL.
   - Laboratory Qualifier(s).
   - Unit.
6. The EDD is uploaded directly to PREmis through a module on the website. The CLP EDD will be uploaded by MPI while the non-CLP EDD will be uploaded by the subcontract laboratory.
7. Once this information is uploaded, only personnel with the proper security level can view the data. First, the data must be validated (See Section 4 – Data Validation and Usability, of this QAPP) and the validator makes changes directly to the data stored in the website (*e.g.*, add validation qualifiers, change concentrations based on blank data). Any changes made to information contained in PREmis is recorded in an electronic audit record; this record stores the original value, the changed value, the name of the person who made the change, and the date and time of the change. Next, the SQO or designee reviews and approves or reviews and changes any changes made by the validator. Once these changes are approved, the data can be viewed by the entire project team.
8. Since all of the data are collected electronically, and since the QC samples are automatically associated with each original sample, the system also generates sample trip reports for use by the data validator.

3.0 ASSESSMENT AND OVERSIGHT

This element addresses assessment of the effectiveness of the project implementation and associated QA/QC activities.

3.1 ASSESSMENT AND RESPONSE ACTIONS

To monitor the capability and performance of the FSP activities, several types of audits will be performed. Technical system audits (TSAs) are field audits that monitor the field techniques, procedures, and overall implementation of the WP (MPI, 2005c), FSP, and QAPP. These audits will be conducted by the SQO or designee. Performance audits (PAs) of laboratories are conducted to measure the accuracy of the measurement systems. Data Quality Audits (DQAs) are conducted to determine if the data generated by the sampling and analysis satisfy the DQOs.

3.1.1 Technical System Audits (TSA)

Field audits will be conducted on an ongoing basis during the project as field data are generated, reduced, and analyzed. Numerical manipulations, including manual calculations, will be documented. Records of numerical analyses will be legible, of reproduction-quality, and sufficiently complete to permit logical reconstruction by a qualified individual other than the originator.

System audits of site activities will be accomplished by an inspection of field site activities. During this audit, the auditor(s) will compare current field practices with standard procedures. The following elements will be evaluated during a TSA:

- Whether activities are conducted in accordance with the WP (MPI, 2005c).
- Whether procedures and analyses are conducted according to procedures outlined in the FSP.
- Whether proper sample documentation is being recorded.
- If the working order of instruments and equipment is being properly checked and recorded.
- The level of QA conducted per each field team.

- Contingency plans in case of equipment failure or other event preventing the planned activity from proceeding.
- Decontamination procedures, if applicable.
- Level of efficiency with which each team conducts planned activities at one site and proceeds to the next.
- Sample packaging and shipment.

TSAs are conducted for each field team at the beginning of each field sampling task to determine if the system is capable of producing data that meet the DQOs. As long as the field team(s) demonstrate proficiency in the sampling procedures being audited, a follow-up audit will not be required. However, if the audit indicates the need for corrective action, a second TSA will be required. Following the initial audit, TSAs will be conducted on the following schedule:

- Whenever key personnel leave the project or new key personnel are added to the project
- Whenever a significant amount of time (> 6 months) has elapsed between TSAs for a particular field task

Any minor deficiencies that are noted during the TSA will be corrected in the field as they occur. If major deficiencies are noted (*i.e.*, those that cannot be immediately corrected in the field), a Stop-Work Order will be issued until appropriate measures can be taken to correct the problem. To issue a Stop-Work Order, written authorization is required from the MPI PM. The conditions and need for a Stop-Work Order will be documented in sufficient detail to permit evaluation of the deficiency and determination of proper corrective action. Pertinent communications with the Field Team Leader, SQO, DPM, and PM that pertain to an evaluation of the problem along with potential solutions and their implementation will be attached to the Order. In order for work to resume following a Stop-Work Order, the MPI PM and SQO must rescind it in writing. The SQO is responsible for tracking non-conforming conditions, evaluating the effectiveness of corrective measures, and assuring that the necessary steps have been taken to prevent recurrence of the original problem.

Regardless of whether major, minor, or no deficiencies were noted during the audit, a written report of the TSA will be prepared by the SQO and submitted to the MPI,

USEPA, and USACE PM, as well as the Field Team Leader and the field team. This report will identify any deficiencies found and will outline the corrective actions that were recommended/implemented to address them. A copy of SOP No. 12 on conducting a TSA and an example of an audit form are found in Attachment 10. Note that the audit form contained in the SOP is for example purposes only; the SQO will tailor this form for each type of activity audited. Periodically during the audit, it may be determined that the site program should be modified to increase data quality or efficiency. These modifications will be documented by the MPI PM or SQO in a Field Modification Form. An example of this form can be found in Attachment 11.

3.1.2 Field Corrective Actions

At the end of each sampling day, the sampling team is to report any problems requiring corrective action that were encountered during the day. Corrective action will be undertaken when a non-conforming condition is identified. A non-conforming condition occurs when QA objectives for precision, accuracy, completeness, representativeness or comparability are not met, or when procedural practices or other conditions are not acceptable. A report is to be filed that documents the problems encountered and the corrective action implemented. A Stop-Work Order may be issued by the SQO, following notification to the PM, if corrective action does not adequately address a problem, or if no resolution can be reached.

3.1.3 Performance Audits

A PA consists of sending a laboratory a performance evaluation (PE) sample for analysis. The PE sample is a sample of known concentration that is analyzed by the laboratory and the analytical results are compared with the actual concentration. The results provide a measure of laboratory performance that is used along with other QA criteria to monitor laboratory capability. PAs for this project will be conducted by the USACE.

3.1.4 Internal Laboratory Audits

As part of its QA program, the Laboratory Quality Assurance Manager (QAM) will conduct periodic checks and audits of the analytical systems, to ensure that analytical systems are working properly and personnel are adhering to established procedures and

documenting the required information. These checks and audits will also assist in determining or detecting where problems are occurring.

In addition to conducting internal reviews and audits, as part of its established QA program, the laboratory is required to take part in regularly scheduled Performance Evaluations and laboratory audits from State and Federal agencies for applicable tests. Each laboratory selected to support this program must maintain current State and Federal certifications, as appropriate.

3.1.5 Laboratory Corrective Actions

If a particular laboratory analysis is deemed “out of control”, corrective action will be taken by the laboratory to ensure continued data quality. Each laboratory must adhere to their in-house corrective action policy. The coordinator of the laboratory's analytical section will be responsible for initiating laboratory corrective action when necessary.

3.1.6 Data Quality Audits

DQAs are conducted to determine if the data are adequate to support the DQOs and to determine the cause of deficiencies in the event that the data quality is not adequate. This audit is conducted by the SQO after the data have been fully validated. The SQO will first determine to what extent the data can be used to support the decision making process. If the data are deficient, the SQO will identify the cause of the deficiency and will determine what modifications need to be made (*e.g.*, have the laboratory analyze a larger volume sample to lower the RLs) so that subsequent data are acceptable.

4.0 DATA VALIDATION AND USABILITY

These elements are implemented so that the individual data elements conform to the specified criteria and to enable reconciliation with the project's objectives. This group of elements covers the QA activities that occur subsequent to the data collection phase of the project.

4.1 DATA REVIEW, VERIFICATION AND VALIDATION

4.1.1 EPA CLP Data

Validation will be accomplished by comparing the contents of the data packages and QA/QC results to the requirements contained in the applicable analytical methods and the laboratory SOWs. A sample trip report will be generated by PREmis that details which QA/QC samples (*e.g.*, rinsate blanks, duplicates) are associated with which environmental samples. All TAL/TCL data generated through the CLP will be validated by RSCC by using the latest applicable USEPA Region 2 validation procedures and according to the following USEPA national guidance documents or their most recent revisions:

- USEPA CLP National Functional Guidelines for Organic Data Review, OSWER 9240.1-5A-P, October 1999.
- USEPA CLP National Function Guidelines for Inorganic Data Review, OSWER 9240.1-45, October 2004.

The dioxin/furan data generated through the CLP will be validated either by RSCC, MPI, or a qualified subcontractor. The protocols for validating the dioxin/furan data are contained in:

- USEPA Analytical Operations/Data Quality Center (AOC) National Functional Guidelines for Chlorinated Dioxin/Furan Data Review, OSWER 9240.1-37, August 2002.

4.1.2 Non-CLP Data

The non-CLP data will be validated by MPI or a qualified subcontractor. Although no validation guidelines exist for these parameters, the validation will follow

the laboratory SOWs (see Attachment 3.1 and 3.2), the National Functional Guidelines, and any applicable Region 2 guidelines. For the first two sample delivery groups (SDGs) received for each analytical parameter, the validator will conduct a 100% validation. This means that the validator will review all of the raw data, all of the log book sheets, and will recalculate all of the sample and QC sample results. If this validation indicates that the laboratory is producing acceptable data, the validation will be scaled back to a 10% spot check (~10%) of the information contained on the laboratory summary forms versus the raw data (*e.g.*, GC/MS chromatograms and mass spectra). Depending on the parameter, the 10% spot check could include a 100% validation of 10% of the samples or a validation that does not recalculate any of the sample or QC results and is based on the numbers given on the QA/QC summary forms. The type of validation performed will be documented by the validator in the validation report. If any errors are problems are found by the validator, a 100% validation will be performed on the SDG, as well as any subsequent SDGs, until the problem is corrected. In addition, once every 6 months, one SDG for each parameter will be randomly selected for a 100% validation.

Once data validation is completed, a data validation report will be generated. The report will contain information regarding which parameters are qualified, the reason for the qualification, and the direction of the bias (only for parameters qualified as estimated). The validation report will be uploaded to the Digital Library in PREmis and the validation qualifiers will be added to the electronic data stored in PREmis.

Based upon the quality assurance review of the analytical data, specific codes (data qualifiers or 'flags') will be placed next to results in the database to provide an indication of the quantitative and qualitative reliability of the results. These defined qualifier codes will serve as an indication of qualitative and quantitative reliability. The following data qualifier codes are proposed for this project:

- U: The compound/analyte was analyzed for, but was not detected above the reported sample quantitation/detection limit. This applies to both samples in which the sample was reported as not detected by the laboratory, as well as compound/analytes which are considered "not detected" since it was detected in a blank at a similar level, as determined during the data quality review/data validation process.
- J: Quantitation is approximate (estimated) due to limitations identified during the quality assurance review (data validation). This qualifier is applied to all data which were reported as detected at a concentration outside the limits of the calibrated range

of the analysis, as well as for other reasons (minor deviations from QA/QC criteria) as determined during the data quality review/data validation process).

- N: The analysis indicates that there is presumptive evidence to make a "tentative identification" of this compound/analyte. This flag is applicable only to organic analyses and is applied by the laboratory when an analyte does not meet all of the specified criteria for confident identification of the analyte, but is believed to be present based on the analyst's judgment.
- R: Unusable (rejected) result – compound/analyte may or may not be present in this sample.
- UJ: This compound/analyte was not detected, but the quantitation/detection limit is uncertain due to QA/QC issues identified during the quality assurance review.
- EMPC: (dioxin analyses only). Estimated Maximum Possible Concentration; chromatographic peaks are present in the expected retention time window, but, the peaks do not meet all of the conditions required for a positive identification. The reported result represents the estimated maximum possible concentration if the dioxin or furan was present.

Additional qualifiers may be present on data generated by the laboratory and will be identified in the data deliverable.

4.1.3 Field Data Evaluation

Procedures to evaluate field data for this program include reviewing the data entered into the field laptop computers to insure that transcription errors have not been made. The field data documented includes data generated during measurement of field parameters, observations, results of any quality control sample analyses, and field instrument calibrations. This task will be the responsibility of the Field Team Leader or designee.

4.2 RECONCILIATION WITH USER REQUIREMENTS

The SQO, in conjunction with the PM, will determine whether field and analytical data or data sets meet the requirements necessary for decision-making. The results of the measurements will be compared to the DQOs set forth in Attachment 1.1 of the QAPP. As data are evaluated, anomalies in the data or data gaps may become apparent to the data users. Data that do not meet the DQOs will be identified and appropriately noted in

the project database so data users are aware of any limitations or concerns with the usability of the data.

If systematic problems with the laboratory data are encountered, the SQO will review the data to determine whether problems are field- or laboratory-related. The laboratory will be contacted for their analysis of the situation, along with recommendations to correct the problem. If the problem persists, a new subcontract laboratory may be required.

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6.0 GLOSSARY AND ACRONYMS

%R	Percent Recovery
AES	Atomic Emission Spectroscopy
AL	Action Level
AOC	Analytical Operations/Data Quality Center
AVS	Acid Volatile Sulfide
Be-7	Beryllium-7
BOD	Biological Oxygen Demand
CAS	Chemical Abstracts Services
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
GC	Gas Chromatography
GC-ECD	Gas Chromatography-Electron Capture Detector
GC-FPD	Gas Chromatography-Flame Photometric Detector
GC-MS	Gas Chromatography-Mass Spectrometry
GC-MS-SIM	Gas Chromatography-Mass Spectrometry-Selective Ion Monitoring
CIH	Certified Industrial Hygienist
CLP	Contract Laboratory Program
COC	Chain of Custody
COD	Chemical Oxygen Demand
COPC	Chemical of Potential Concern
COPEC	Chemical of Potential Ecological Concern
Cs-137	Cesium-137
CSM	Conceptual Site Model
CSP	Certified Safety Professional
CSO	Combined Sewer Outfall
CVAA	Cold Vapor Atomic Absorption
CVAFS	Cold Vapor Atomic Fluorescence Spectrometry
DL	Detection Limit
DOC	Dissolved Organic Carbon
DOT	Department of Transportation
DPM	Deputy Project Manager
DQA	Data Quality Audit
DQO	Data Quality Objectives
ECD	Electronic Capture Detector
EDD	Electronic Data Deliverable
EML	Estimated Method Limit
EMPC	Estimated Maximum Possible Concentration

FS	Feasibility Study
FSP	Field Sampling Plan
GC/MS	Gas Chromatography/ Mass Spectrometry
GIS	Geographical Information System
HASL	Health and Safety Laboratory
HASP	Health and Safety Plan
HRGC/HRMS	High Resolution Gas Chromatography-High Resolution Mass Spectrometry
HRGC/LRMS	High Resolution Gas Chromatography-Low Resolution Mass Spectrometry
ICP	Inductively Coupled Plasma
ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectrometry
ICP-MS	Inductively Coupled Plasma-Mass Spectrometry
LCS	Laboratory Control Standard
LIMS	Laboratory Information Management System
MDL	Method Detection Limit
MEDD	Multi-Media Electronic Data Deliverable
MD	Matrix Duplicate
MNR	Monitored Natural Recovery
MPI	Malcolm Pirnie, Inc.
MS	Mass Spectrometer *or* Matrix Spike
MSD	Matrix Spike Duplicate
NELAP	National Environmental Laboratory Accreditation Program
ng/kg	nanogram/kilogram
NOAA	National Oceanic and Atmospheric Administration
NJADN	New Jersey Atmospheric Deposition Network
NJDEP	New Jersey Department of Environmental Protection
NJDOT	New Jersey Department of Transportation
NS&T	National Status and Trends
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OMR	Office of Maritime Research
OPR	Ongoing Precision and Recovery
PA	Performance Audit
PAH	Polycyclic Aromatic Hydrocarbon
PAR	Pathways Analysis Report
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
Pb-210	Lead-210

PCB	Polychlorinated Biphenyl
PCDD	Polychlorinated Dibenzodioxin
PCDF	Polychlorinated Dibenzofuran
PE	Performance Evaluation
pg/g	picogram/gram
pg/L	picogram per Liter
PID	Photoionization Detector
PM	Project Manager
Po-210	Polonium-210
ppb	parts per billion
ppm	parts per million
ppq	parts per quadrillion
ppt	parts per trillion
PREmis	Passaic River Estuary Management Information System
PRP	Potentially Responsible Party
PSO	Project Safety Officer
QA	Quality Assurance
QAC	Quality Assurance Coordinator
QAM	Quality Assurance Manager
QAPP	Quality Assurance Project Plan
QC	Quality Control
QCCS	Quality Control Check Sample
QCP	Quality Control Plan
QCS	Quality Control Standard
QCT	Quality Control Team
QL	Quantitation Limit
R	Recovery
RA	Risk Assessment
RBC	Risk Based Concentration
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RL	Reporting Limit
Rn-226	Radon-226
RPD	Relative Percent Difference
RSCC	Regional Sample Control Coordinator
SEM	Simultaneously Extractable Metals
SDG	Sample Delivery Group
SMO	Sample Management Officer

SOP	Standard Operating Procedure
SOW	Statement of Work
SQO	Site Quality Control Officer
SVOC	Semi-Volatile Organic Compound
TAC	Technical Advisory Committee
TAL	Target Analyte List
TCL	Target Compound List
TPH	Total Petroleum Hydrocarbons
TEQ	Toxic Equivalency Quotient
Th-234	Thorium-234
TSA	Technical System Audit
TSI	Tierra Solutions, Inc.
ug/kg	microgram per kilogram
um	micrometer
USACE-KC	United States Army Corps of Engineers-Kansas City District
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	Volatile Organic Compound
WP	Work Plan
WRDA	Water Resources Development Act
XRF	X-Ray Fluorescence

TABLE 1-1: Technical Advisory Committee Members

Technical Advisory Committee Members		
Name	**Affiliation**	**Area(s) of Expertise**
Richard Bopp, PhD	Rensselaer Polytechnic Institute	Environmental and tracer geochemistry; field sampling techniques; analytical chemistry
Bruce Brownawell, PhD	State University of New York at Stony Brook	Sediment geochemistry; contaminant fate and transport assessment and modeling; field sampling techniques; analytical chemistry
Jon Butcher, PhD, PH	Tetra Tech, Inc.	Hydrology; fate and transport modeling; watershed modeling; uncertainty modeling and analysis; environmental statistics; geostatistics
Frank Gobas, PhD	Simon Fraser University	Bioaccumulation and food chain modeling
John Henningson, PE	Henningson Environmental Services	Remediation and restoration technologies and methods
Willy Lick, PhD	University of California at Santa Barbara	Sediment transport assessment and modeling
Richard Luthy, PhD, PE	Stanford University	Remediation and restoration technologies and methods
Rob Mason, PhD	University of Maryland	Mercury modeling; field sampling techniques; environmental fate and transport analysis

TABLE 2-1: Reporting Limits for TAL Metals plus Cyanide (Requested through USEPA-CLP)

Inorganic Parameter	Water (*u*g/L)	Soil/Sediment-dry weight (mg/kg)
Aluminum	200	20
Antimony*	2	1
Arsenic*	**0.5**	**0.25**
Barium*	10	5
Beryllium*	1	**0.25**
Cadmium*	1	**0.25**
Calcium	5000	500
Chromium*	2	1
Cobalt*	1	0.5
Copper*	**1**	1
Iron	100	10
Lead*	1	0.5
Magnesium	5000	500
Manganese*	1	0.5
Mercury*	**0.05**	**0.02**
Nickel*	1	0.5
Potassium	5000	500
Selenium*	**1**	0.5
Silver*	**0.5**	**0.25**
Sodium	5000	500
Thallium*	1	0.5
Titanium**	10	100
Vanadium*	1	0.5
Zinc*	2	1
Cyanide*	**5**	2.5

* Identified as a COPC/COPEC in the Pathways Analysis Report (PAR).

** Identified as a COPC/COPEC, but not on the standard CLP list, will be requested for analysis under the CLP flex clause.

Note: The target RLs have been reviewed with the USEPA CLP Region 2 Program Officer and will be requested under the CLP flex clause to meet the project data needs**.**

TABLE 2-2: Reporting Limits for TCL VOCs
(Requested through EPA-CLP)

VOCs	Water (ug/L)	Sediment Dry weight (ug/kg)
Dichorodifluoromethane	0.5	5
Chloromethane	0.5	5
Vinyl Chloride	0.5	5
Bromomethane	0.5	5
Chloroethane	0.5	5
Trichlorofluoromethane	0.5	5
1,1-Dichloroethene	0.5	5
1,1,2-Trichloro-1,2,2-trifluoroethane	0.5	5
Acetone	5	10
Carbon Disulfide	0.5	5
Methyl Acetate	0.5	5
Methylene Chloride*	0.5	5
Trans-1,2-Dichloroethene*	0.5	5
Methyl tert-Butyl Ether	0.5	5
1,1-Dichloroethane	0.5	5
cis-1,2-Dichloroethene*	0.5	5
2-Butanone*	5	10
Bromochloromethane	0.5	5
Chloroform	0.5	5
1,1,1-Trichloroethane	0.5	5
Cyclohexane	0.5	5
Carbon Tetrachloride	0.5	5
Benzene*	0.5	5
1,2-Dichloroethane	0.5	5
1,4-Dioxane	20	100
Trichloroethene	0.5	5
Methlycyclohexane	0.5	5

* Identified as a COPC/COPEC in the PAR.

Note: The target RLs have been reviewed with the USEPA CLP Region 2 Program Officer and will be requested under the CLP flex clause to meet the project data needs.

TABLE 2-2 (Continued):
Reporting Limits for TCL VOCs
(Requested through USEPA-CLP)

VOCs	Water (ug/L)	Sediment Dry weight (ug/kg)
1,2-Dichloropropane	0.5	5
Bromodichloromethane	0.5	5
cis- 1,3-Dichloropropene	0.5	5
4-Methyl-2-pentanone	5	10
Toluene	0.5	5
Trans-1,3-Dichloropropene	0.5	5
1,1,2-Trichloroethane	0.5	5
Tetrachloroethene	0.5	5
2-Hexanone	0.5	5
Dibromochloromethane	10	5
1,2-Dibromoethane	0.5	5
Chlorobenzene*	0.5	5
Ethylbenzene*	0.5	5
o-Xylene	0.5	5
M, p-Xylene	0.5	5
Styrene	0.5	5
Bromoform	0.5	5
Isopropylbenzene	0.5	5
1,1,2,2-Tetrachloroethane	0.5	5
1,3-Dichlorobenzene	0.5	5
1,4-Dichlorobenzene*	0.5	5
1,2-Dichlorobenzene	0.5	5
1,2-Dibromo-3-chloropropane	0.5	5
1,2,4-Trichlorobenzene*	0.5	5
1,2,3-Trichlorobenzene	0.5	5

* Identified as a COPC/COPEC in the PAR.

Note: The target RLs have been reviewed with the USEPA CLP Region 2 Program Officer and will be requested under the CLP flex clause to meet the project data needs.

TABLE 2-3:
Reporting Limits for TCL SVOCs including PAHs
(Requested through USEPA-CLP)

SVOCs (including PAHs)	Water (*u*g/L)	Sediment-dry weight (ug/Kg)
Benzaldehyde	0.1	3.3
Phenol	0.1	3.3
bis-(2-Chloroethyl)ether	0.1	3.3
2-Chlorophenol	0.1	3.3
2-Methylphenol	0.1	3.3
2,2'-Oxybis (1-Chloropropane)	0.1	3.3
Acetophenone	0.1	3.3
4-Methylphenol	0.1	3.3
N-Nitroso-di-n-propylamine	0.1	3.3
Hexachloroethane	0.1	3.3
Nitrobenzene	0.1	3.3
Isophorone	0.1	3.3
2-Nitrophenol	0.1	3.3
2,4-Dimethylphenol	0.1	3.3
bis-(2-Chloroethoxy)methane	0.1	3.3
2,4-Dichlorophenol	0.1	3.3
Naphthalene*	0.1	3.3
4-Chloroaniline	0.1	3.3
Hexachlorobutadiene	0.1	3.3
Caprolactam	0.1	3.3
4-Chloro-3-methylphenol	0.1	3.3
1-Methylnaphthalene	0.1	3.3
2-Methylnaphthalene*	0.1	3.3
Hexchlorocyclo-pentadiene	0.1	3.3
2,4,6-Trichlorophenol	0.1	3.3
2,4,5-Trichlorophenol	0.1	3.3
1,1'-Biphenyl*	0.1	3.3

* Identified as a COPC/COPEC in the PAR.

** Identified as a COPC/COPEC, but not on the standard CLP list, will be requested for analysis under the CLP flex clause.

Note: The target RLs have been reviewed with the USEPA CLP Region 2 Program Officer and will be requested under the CLP flex clause to meet the project data needs.

TABLE 2-3 (Continued):
Reporting Limits for TCL SVOCs including PAHs
(Requested through USEPA-CLP)

SVOCs (including PAHs)	Water (*u*g/L)	Sediment-dry weight (ug/Kg)
2-Chloronaphthalene	0.1	3.3
2-Nitroaniline	0.1	3.3
Dimethylphthalate	0.1	3.3
2,6-Dinitrotoluene	0.1	3.3
Acenaphthylene*	0.1	3.3
3-Nitroaniline	0.2	6.7
Acenaphthene*	0.1	3.3
2,4-Dinitrophenol	0.1	3.3
4-Nitrophenol	0.1	3.3
Dibenzofuran	0.1	3.3
2,4-Dinitrotoluene	0.1	3.3
Diethylphthalate	0.1	3.3
Fluorene*	0.1	3.3
4-Chlorophenyl-phenyl ether	0.1	3.3
4-Nitroaniline	0.2	6.7
4,6-Dinitro-2-methylphenol	0.2	6.7
N-Nitrosodiphenylamine*	0.1	3.3
1,2,4,5-Tetrachlorobenzene	0.1	3.3
4-Bromophenyl-phenylether	0.1	3.3
Hexachlorobenzene	0.1	3.3
Atrazine	0.1	3.3
Pentachlorophenol	0.2	6.7
Phenanthrene*	0.1	3.3
Anthracene*	0.1	3.3
Carbazole*	0.1	3.3

* Identified as a COPC/COPEC in the PAR.

** Identified as a COPC/COPEC, but not on the standard CLP list, will be requested for analysis under the CLP flex clause.

Note: The target RLs have been reviewed with the USEPA CLP Region 2 Program Officer and will be requested under the CLP flex clause to meet the project data needs.

TABLE 2-3 (Continued):
Reporting Limits for TCL SVOCs including PAHs
(Requested through USEPA-CLP)

SVOCs (including PAHs)	**Water (*u*g/L)**	**Sediment-dry weight (ug/Kg)**
Di-n-butylphthalate	0.1	3.3
Fluoranthene*	0.1	3.3
Pyrene*	0.1	3.3
Butylbenzylphthalate*	0.1	3.3
3,3',-Dichlorobenzidine	0.1	3.3
Benzo(a)anthracene*	0.1	3.3
Chrysene*	0.1	3.3
bis(2-Ethylhexyl)phthalate*	0.1	3.3
Di-n-octylphthalate*	0.1	3.3
Benzo(b)fluoranthene*	0.1	3.3
Benzo(k)fluoranthene*	0.1	3.3
Benzo(a)pyrene*	0.1	3.3
Indeno(1,2,3-cd)-pyrene*	0.1	3.3
Dibenzo(a,h)-anthracene*	0.1	3.3
Benzo(g,h,i)perylene*	0.1	3.3
2,3,4,6-Tetrachlorophenol	0.1	3.3
Benzo(e)pyrene**	0.1	3.3
1-Methyl-phenanthrene**	0.1	3.3
2,3,5-Trimethylnaphthalene**	0.1	3.3
2,6-Dimethylnaphthalene**	0.1	3.3
Perylene**	0.1	3.3
Dibenzothiophene**	0.1	3.3

* Identified as a COPC/COPEC in the PAR.

** Identified as a COPC/COPEC, but not on the standard CLP list, will be for analysis under the CLP flex clause.

Note: The target RLs have been reviewed with the US-EPA CLP Region 2 Program Officer and will be requested under the CLP flex clause to meet the project data needs.

TABLE 2-4: Reporting Limits for Pesticides
(Requested through USEPA-CLP)

Pesticides	**Water (*u*g/L)**	**Sediment Dry weight (ug/Kg)**
alpha-BHC*	0.005	0.2
beta-BHC*	0.005	0.2
delta-BHC	0.005	0.2
gamma-BHC (Lindane)*	0.005	0.2
Hetachlor*	0.005	0.2
Aldrin*	0.005	0.2
Heptachlor epoxide*	0.005	0.2
Endosulfan I*	0.005	0.2
Dieldrin*	0.005	0.2
4,4'-DDE*	0.005	0.2
Endrin*	0.005	0.2
Endosufan II*	0.005	0.2
4,4'DDD*	0.005	0.2
Endosulfan sulfate	0.005	0.2
4,4'-DDT*	0.005	0.2
Methoxychlor*	0.01	0.3
Endrin ketone	0.005	0.2
Endrin aldehyde	0.005	0.2
alpha-Chlordane*	0.005	0.2
gamma-Chlordane*	0.005	0.2
Toxaphene*	0.5	17
2,4'DDD**	0.005	0.2
2,4'DDE**	0.005	0.2
2,4'DDT**	0.005	0.2

* Identified as a COPC/COPEC in the PAR.

** Identified as a COPC/COPEC, but not on the standard CLP list, will be for analysis under the CLP flex clause.

Note: The target RLs have been reviewed with the USEPA CLP Region 2 Program Officer and will be requested under the CLP flex clause to meet the project data needs.

TABLE 2-5: Reporting Limits for PCB Aroclors (Requested through USEPA-CLP)

PCB-Aroclors	Water (ug/L)	Sediment Dry weight (ug/Kg)
Aroclor 1016	**0.1**	3
Aroclor 1221	**0.1**	3
Aroclor 1232	**0.1**	3
Aroclor 1242	**0.1**	3
Aroclor 1248	**0.1**	3
Aroclor 1254	**0.1**	3
Aroclor 1260	**0.1**	3

Note: The target RLs have been reviewed with the USEPA CLP Region 2 Program Officer and will be requested under the CLP flex clause to meet the project data needs.

TABLE 2-6: Reporting Limits for Dioxins/Furans (Requested through USEPA-CLP)

Dioxins-Furans by 1613	Water (pg/L)	Sediment Dry weight (ng/kg)
2,3,7,8-TCDD	5	0.5
1,2,3,7,8-PeCDD	25	2.5
1,2,3,4,7,8-HxCDD	25	2.5
1,2,3,6,7,8-HxCDD	25	2.5
1,2,3,7,8,9-HxCDD	25	2.5
1,2,3,4,6,7,8-HPCDD	25	2.5
OCDD	50	5.0
2,3,7,8-TCDF	5	0.5
1,2,3,7,8-PECDF	25	2.5
2,3,4,7,8-PECDF	25	2.5
1,2,3,4,7,8-HXCDF	25	2.5
1,2,3,6,7,8-HXCDF	25	2.5
2,3,4,6,7,8-HXCDF	25	2.5
1,2,3,7,8,9-HXCDF	25	2.5
1,2,3,4,6,7,8-HPCDF	25	2.5
1,2,3,4,7,8,9-HPCDF	25	2.5
OCDF	50	5.0

Note: The target RLs have been reviewed with the USEPA CLP Region 2 Program Officer and will be requested under the CLP flex clause to meet the project data needs.

TABLE 2-7: Reporting Limits for Chlorinated Biphenyls

PCB Congeners by 1668A	**Water (pg/L)**	**Sediment-dry weight (ng/kg)**
PCB 77	500	50
PCB 81	500	50
PCB 105	200	20
PCB 114	500	50
PCB 118	500	50
PCB 123	500	50
PCB 126	500	50
PCB 156	500	50
PCB 157	500	50
PCB 167	500	50
PCB 169	500	50
PCB 189	500	50
PCB 18	500	50
PCB 28	500	50
PCB 44	500	50
PCB 49	500	50
PCB 52	500	50
PCB 66	500	50
PCB 101	1000	100
PCB 110	1000	100
PCB 87	500	50
PCB 128	500	50
PCB 138	500	50

TABLE 2-7 (Continued): Reporting Limits for Chlorinated Biphenyls

PCB Congeners by 1668A	Water (pg/L)	Sediment-dry weight (ng/kg)
PCB 153	500	50
PCB 170	500	50
PCB 180	500	50
PCB 183	1000	100
PCB 187	500	50
PCB 195	1000	100
PCB 206	1000	100
PCB 209	500	50
Other PCB congeners	The Target Reporting Limits for the PCB congeners are equal to the estimated method limits (EMLs) listed for "water" in table 2 of 1668A	The Target Reporting Limits for the PCB congeners are equal to the EMLs listed for "other" in table 2 of 1668A

Note: The specific detection limits are highly matrix dependent. The laboratory detection limits should be at least three times less than the reporting limits. Method 1668A can detect all 209 congeners, but only 125-150 can be resolved completely. The remaining congeners are determined as co-eluting combinations of congeners. The PCB toxicity equivalent (PCB_{TEQ}) and the PCB homologue distribution are calculated from the concentrations of the individual congeners.

NOTE: Current plans are to obtain 1668A PCB Congener analyses for the project from a non-CLP laboratory.

TABLE 3-1: Sample Bottle, Volume, and Preservation Specifications and Holding Times for Analysis of Samples for Non-Organics in Sediments

PARAMETER ANALYZED	APPROXIMATED VOLUME	CONTAINER MATERIAL	PRESERVATION	HOLDING TIME
TAL and SEM Metals	32 oz.	G	4°C	6 months
Cyanide				14 days
Mercury				28 days
Arsenic Speciation	4 oz.	G	No head space, kept field moist, store at 4°C, not allowed to air dry.	28 days
Methyl Mercury	4 oz.	G	Frozen upon collection and shipped frozen.	Stored frozen for up to 28 days
Chromium, Hexavalent	8 oz	G	No head space, kept field moist, store at 4°C, not allowed to air dry.	30 days collection, 7 days extraction[a]
Acid Volatile Sulfide	4 oz.	G	No head space, kept field moist, store at 4°C; not allowed to air dry.	14 days
XRF Screening for Metals	8 oz.	G	4°C	6 months
Nitrogen Kjeldahl	4 oz.	G	Cool 4°C	28 days
Radionuclides	16 oz.	G	None	1 month[b]

G=Glass

Note: If a sediment sample is frozen at the time of collection for this project the holding times listed begin after the sample is defrosted, except in the case of radionuclide analyses where the holding time starts as soon as the sample is collected.

a. Based upon studies done by Battelle, the holding time for Chromium VI in sediment is 30 days from collection and 7 day from extraction, if preserved properly.

b. Shortest radionuclide holding time listed (1 month for Be-7).

TABLE 3-2: Sample Bottle, Volume, and Preservation and Holding Times for Organics Analysis in Sediment

PARAMETER ANALYZED	APPROX. VOLUME	CONTAINER MATERIAL	PRESERVATION	HOLDING TIME
Volatile Organics	3 x 5g EnCore™	EnCore™	4°C	48 hrs. to extraction; 8 days to analysis
Semivolatile Organics	8 oz.	G, Amber	4°C	7 days to extraction, 40 days until analysis
Pesticides				
Aroclor PCBs				
PCB Congeners 1668A	8 oz.	G, Amber	Maintain in dark at <4°C from time of collection until receipt at lab	If stored at <10°C solid, multiphase samples can be stored for up to one year. Sample extracts can be stored at <10 °C for up to one year.
PCDDs/PCDFs 1613	8 oz.	G, Amber		
Dioxin TEQ/ PCB TEQ Immunoassay Screening	8 oz	G, Amber		
PCDDs/PCDFs 8280A	8 oz.	G, Amber	4°C in dark	30 days to extraction[a], Analyzed within 45 days after extraction
Chlorinated Herbicides	8 oz.	G, Amber	4°C in dark	7 days to extraction, 40 days until analysis
Total Organic Carbon (TOC)	4 oz.	G, Amber	4°C	28 days
Butyltins	4 oz.	G, Amber	4°C	14 days to extraction, 40 days until analysis
Total Petroleum Hydrocarbons	4 oz.	G, Amber	4°C	14 days to extraction, 40 days until analysis

G = Glass

Note: If a sediment sample is frozen at the time of collection for this project the holding times listed begin after the sample is defrosted, except in the case of radionuclide analyses where the holding time starts as soon as the sample is collected.

a) It is recommended that samples be extracted within 30 days, but certain matrices can be stored for up to a year.

TABLE 3-3: Sample Bottle, Volume, and Preservation Specifications and Holding Times for Sediment Samples for Geotechnical Tests

PARAMETER ANALYZED	APPROX. VOLUME	CONTAINER MATERIAL	PRESERVATION	HOLDING TIME
Cation Capacity	8 oz.	G	4°C	6 months
% Moisture	4 oz.	G	Airtight container cooled to 4°C	Test as soon as practical after sampling.
Engineering Parameters: Grain size Density (Specific Gravity) Shear Stress Atterberg Limits	32-64 oz.	G	Airtight container cooled to 4°C	6 months (Grain size and Atterberg Limits should be tested as soon as practical)

G=Glass

Note: If a sediment sample is frozen at the time of collection for this project the holding times listed begin after the sample is defrosted. Freezing of samples for intended for engineering parameter analysis will be avoided, where possible, to prevent altering the sediment structure.

TABLE 3-4: Sample Bottle, Volume, and Preservation Specifications for Analysis of Organics in Water Samples

PARAMETER ANALYZED	APPROX. VOLUME	CONTAINER MATERIAL	PRESERVATION	HOLDING TIME
Volatile Organics	40 mL VOC vial (in triplicate)	G, Teflon-line septa	4°C; no bubbles or headspace, HCL to pH<2	14 days
Semivolatile Organics	1 liter[a]	G, Amber	4°C	7 days to extraction, 40 days until analysis
Pesticides	1 liter[a]	G, Amber	4°C	
Aroclor PCBs	1 liter[a]	G, Amber	4°C	
PCB Congeners and Homologues 1668A	1 liter[a]	G, Amber	Adjust pH to 2-3 with sulfuric acid. Maintain in dark at 0-4°C from time of collection until receipt at lab	At 0-4°C in the dark; aqueous samples can be stored for up to one year. Extracts can be stored at <10 °C for up to one year.
PCDDs/PCDFs 1613B	1 liter[a]	G, Amber	Maintain in dark at 0-4°C from time of collection until receipt at lab	At 0-4°C in the dark; aqueous samples can be stored for up to one year. Extracts can be stored at <10 °C for up to one year.
PCDDs/PCDFs 8280A	1 liter[a]	G, Amber	4°C in the dark	30 days to extraction[b]; Analyze within 45 days after extraction.
Chlorinated Herbicides	1 liter[a]	G, Amber	4°C in the dark	7 days to extraction, 40 days until analysis
Methane	Five 40 mL VOC vials	G, Teflon-line septa	2 drops of 1:1 HCL, no bubbles or headspace, 4°C	14 days

G = Glass

(a): For each one-liter sample sent to a laboratory for extractable analysis an extract one-liter bottle should be provided, in case of breakage or spillage from one of the sample bottles.

(b): It is recommended that samples be extracted within 30 days, but certain matrices can be stored for up to a year.

TABLE 3-4 (Continued): Sample Bottle, Volume, and Preservation Specifications for Analysis of Organics in Water Samples

PARAMETER ANALYZED	APPROX. VOLUME	CONTAINER MATERIAL	PRESERVATION	HOLDING TIME
Total Organic Carbon (TOC)	250 mL	G	4°C; H_2SO_4 to pH<2	28 days
Dissolved Organic Carbon (DOC)	250 mL	G	4°C; Filter within 48 hours than H_2SO_4 to pH<2	28 days
Particulate Organic Carbon (POC)	Collect directly on filter or collect gallon or more to be filtered.	Plastic container or G Amber bottles or can be collected directly on glass fiber filter	Filter immediately after collection and store at 4°C	Must be filtered within 5 days. Store filter frozen or after drying in a desiccator for up to 100 days
Butyltins	1 Liter	G, Amber	4°C	7 days to extraction, 40 days after extraction
Total Petroleum Hydrocarbons	1 Liter	G	4°C	14 days to extraction, 40 days until analysis

G = Glass

TABLE 3-5: Sample Bottle, Volume, and Preservation Specifications for Analysis of Inorganics in Water

PARAMETER ANALYZED	APPROXIMATED VOLUME	CONTAINER MATERIAL	PRESERVATION	HOLDING TIME
TAL Metals plus Titanium	1 Liter	G	HNO_3 to pH <2, Cool at 4°C	6 months
Cyanide	1 Liter	G	4°C	14 days
Mercury	1 Liter	G	HNO_3 to pH <2, Cool at 4°C	28 days
Arsenic Speciation	500 mL.	G	HCl to pH <2 Cool at 4°C	28 days
Methyl Mercury	125 mL	G	Acidify[a] Cool at 4°C	6 months
Chromium, Hexavalent	8 oz	G	Cool at 4°C	24 hours[b]

G=Glass

(a): **Saline samples must be preserved with 2 mL/L of 9 M H_2SO_4 solution.** Fresh water sample are preserved with 4 mL/L of concentrated HCl. Aqueous samples must be acid preserved within 48 hours of collection. Acid preserved samples are stable for at least six months, if kept dark and cool.
(b): For this project if the sample is analyzed on the next calendar day after collection, it will be considered that it has met the holding time.

TABLE 3-6: Sample Bottle, Volume, and Preservation Specifications and Holding Times for Water Samples for Wet Chemistry and Radiochemistry Parameters

PARAMETER ANALYZED	APPROXIMATED VOLUME	CONTAINER MATERIAL	PRESERVATION	HOLDING TIME
Total Phosphate & Orthophosphate	500 mL	G	H_2SO_4 to pH <2 Cool 4°C	28 days
Nitrogen (Kjeldahl)	500 mL	G	H_2SO_4 to pH <2 Cool 4°C	28 days
Sulfides	500 mL	poly	4 drops zinc acetate solution per 100 mL, NaOH to pH >12, Cool 4°C	7 days
Ammonia	1 Liter	G	H_2SO_4 to pH <2. Cool at 4°C (no headspace)	28 days
Chemical Oxygen Demand	250 mL	G, Amber	H_2SO_4 to pH <2 Cool 4°C	28 days
Biological Oxygen Demand	1 Liter	G	Cool 4°C	48 hours
Total Dissolved Solids	1 Liter	G	Cool 4°C	7 days
Total Suspended Solids				
Volatile Suspended Solids				
Chlorophyll a	4 Liters	G or Plastic	Filter in subdued light as soon as possible. Freeze filters.	Frozen filters can be held up to 3.5 weeks
pH	a	G	Cool 4°C	24 hours
Radon	40 mL	Glass Vials	No air bubbles, ship in an insulated package to maintain constant temperature	4 days
Beryllium-7 and Thorium-234	collected on filters	NA	None	1 month

G=Glass

a. For this project pH will be measured using a field instrument or on occasion by the lab on a portion of sample collected for another test.

TABLE 4-1: ANALYTICAL METHODS FOR INORGANIC PARAMETERS

PARAMETER	TECHNIQUE	WATER	SEDIMENT
TAL Metals and titanium	ICP-AES,ICP-MS etc.	EPA-CLP (ILM0.5.3)	
Cyanide	Colorimetric	EPA-CLP (ILM0.5.3)	
Total Mercury	CVAFS	EPA-CLP (ILM0.5.3)	
Arsenic, Arsenic III and Arsenic V	Hydride Generation Quartz Furnace Atomic Absorption	EPA 1632A[d]	EPA 1632A plus modifications for extraction of sediment
Methyl Mercury	CVAFS	EPA 1630	EPA 1630
Chromium, Hexavalent, ppt	Ion Chromatography	7199/3060A[a]	7199/3060A[a]
Acid Volatile Sulfide	Acidification to H_2S than purge and trap	NA	EPA 821-R-91-100[c]
SEM[b] Metals: Cd, Pb, Hg, Ni and Zn	ICP-AES or ICP-MS or GFAA and CVAA.	NA	SW-846 methods[a] or other approved USEPA methods for metals
Screening for Metals at ppm levels by XRF	XRF	NA	6200[a]

(a): USEPA SW-846 "Test Methods for Evaluating Solid Waste," Third Edition, December 1996 including promulgated final update III.

(b): SEM = Simultaneously Extracted Metals

(c): USEPA 821-R-91-100, Draft Analytical Method for the Determination of Acid Volatile Sulfide and Selected Simultaneously Extractable Metals in Sediment, December 1991.

(d): Method 1632 Chemical Speciation of Arsenic in Water and Tissue by Hydride Generation Quartz Furnace Atomic Absorption Spectrometry, Revision A, August 1998.

TABLE 4-2: ANALYTICAL METHODS FOR ORGANIC PARAMETERS

PARAMETER	TECHNIQUE	WATER	SEDIMENT
Volatile Organics	GC/MS-SIM	EPA-CLP the most recent program for organics SOM1.0, which offers the option for GC-MS-SIM.	
SVOCs plus Pesticides and PCB Aroclors	GC-MS-SIM	EPA-CLP the most recent program for organics SOM1.0, which offers the option for GC-MS-SIM.	
PCB congeners	HRGC-HRMS	EPA 1668A[a]	
PCDDs/PCDFs	HRGC-HRMS	EPA-CLP DLM01.4 (EPA 1613B[b])	
PCDDs/PCDFs	HRGC-LRMS	8280A[c]	8280A[c]
Screening for $Dioxin_{TEQ}$ and PCB_{TEQ}	Extraction plus Immunoassay	NA	4025[c] (modified[d])
Chlorinated Herbicides	GC	8151A[c]	8151A[c]
Butyltins	GC-MS or GC-FPD	Lab prepared SOP See Attachment 3.1	Lab prepared SOP See Attachment 3.1

a. Method 1668, Revision A: Chlorinated Biphenyl Congeners in Water, Soil, Sediment, and Tissue by HRGC/MRMS, EPA-821-R-00-002, December 1999.

b. Method 1613, Revision B: Tetra through Octa-Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS, October 1994

c. USEPA SW-846 “Test Methods for Evaluating Solid Waste,” Third Edition, December 1996 including promulgated final update III.

d. Cape Technologies Technical Notes TN-004 and TN-005.

TABLE 4-2 (Continued): ANALYTICAL METHODS FOR ORGANIC PARAMETERS

PARAMETER	TECHNIQUE	WATER	SEDIMENT
Methane	Gas Chromatography	EPA Region 1 NATATTEN Rev 1[a]	NA
TOC	Combustion	NA	Lloyd Kahn[b]
POC	Elemental Analyzer	USEPA 440.0[c]	NA
TOC and DOC[d]	Carbonaceous Analyzer	9060[d]	NA
TPH	Gas Chromatography	8015B[e]	8015B[e]

a USEPA Region 1, Technical Guidance for the Natural Attenuation Indicators: Methane, Ethane, and Ethene, Revision 1, February 21, 2002

b USEPA Region 2, Determination of Total Organic Carbon in Sediment (Lloyd Kahn Method) July 27, 1988

c USEPA Method 440.0, Determination of Carbon and Nitrogen in Sediments and Particulates of Estuarine/Coastal Waters Using Elemental Analysis

d Determination of DOC requires that the sample be passed through a 0.45-um (micrometer) filter prior to analysis to remove any particulate organic carbon. Refer to USEPA Method 415.3, Rev. 1, June 2003 for a description of a suitable filtration procedure.

TABLE 4-3: TEST METHODS FOR WET CHEMISTRY PARAMETERS

PARAMETER	TECHNIQUE	WATER	SEDIMENT
Total Phosphate and Orthophosphate	Colorimetric	EPA 365.2	NA
Nitrogen (Kjeldahl)	Distillation	EPA 351.3	
Sulfides	Titration or ion selective electrode	9030B/9034[a]	NA
Ammonia	Colorimetric	EPA 350.1	NA
Chemical Oxygen Demand	Titration	EPA 410.3	NA
Biological Oxygen Demand	Membrane	EPA 405.1	NA
Total Dissolved Solids	Gravimetric	EPA 160.1	NA
Total Suspended Solids	Gravimetric	EPA 160.2	NA
Volatile Suspended Solids	Gravimetric	EPA 160.4	NA
Chlorophyll a	Fluorescence	EPA 445.0	NA
pH	Electrode	9045C[a]	

a. USEPA SW-846 "Test Methods for Evaluating Solid Waste," Third Edition, December 1996 I, including promulgated final update III.

TABLE 4-4: TEST METHODS FOR RADIOCHEMISTRY PARAMETERS

PARAMETER	TECHNIQUE	WATER	SEDIMENT
Radon	Liquid Scintillation	SM 7500-Rn B[a]	NA
Be-7 and Th-234 on filtered particles	Gamma-Spec	HASL-300 EML and USEPA 600[b]	NA
Be-7, Cs-137, Rn-226	Gamma-Spec	NA	HASL-300 EML and USEPA-600[b]
Pb-210	Low Energy Gamma Spec or Alpha Spectrometry[b]	NA	

a. Standard Method for Examination of Water and Waster Water, 20th Edition.

b. HASL-300 EML Procedures Manual, U.S. Department of Energy, 28th Edition, Volume 1, February 1997 and/or USEPA-600 4-80-032, Prescribed Procedures for Measurement of Radioactivity in Drinking Water, August 1980. (Cesium-137, Beryillium-7, Radon-226 and Thorium-234 can be determined by Gamma Spec. Lead-210 by Low energy Gamma Spec. or HASL-300 PB-1 or Extraction Chromatography with Alpha Spectrometry 2nd decay daughter Po-210.

TABLE 4-5: TEST METHODS FOR GEOTECHNICAL PARAMETERS IN SEDIMENT

PARAMETER	TEST METHOD
Cation Exchange Capacity	9081[a]
% Moisture	ASTM D2974, Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils – Test Method A
Grain size	ASTM D422, Standard Test Method for Particle-Size Analysis of Soils
Density (Specific Gravity)	ASTM D854, Standard Test Method for Specific Gravity of Soil Solids by Water Pyconmeter
Shear Stress	ASTM D3080, Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions
Atterberg Limits	ASTM D4318, Standard Test Method for Liquid, Plastic Limit, and Plasticity Index

a. USEPA SW-846 "Test Methods for Evaluating Solid Waste," Third Edition, December 1996 I, including promulgated final update III.

Attachment 1.1

Data Quality Objectives

Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements derived from the output of the first six steps of the DQO process. The DQO process is an iterative, strategic planning approach designed to generate environmental data that are the type, quality, and quantity appropriate for utilization in a particular project's decision making process.

This document begins with a "project-level" statement of the DQOs intended to describe the framework for addressing environmental contamination at the Lower Passaic River Restoration Project Study Area (Study Area), focused on the probable decision needs of the project management team, the RI/FS process, and Water Resources Development Act (WRDA) and Natural Resource Damage Assessment (NRDA) data needs. This is followed by 6 tables that present detailed decision rules and tasks for the proposed field data gathering effort.

1.0 State the Problem

Sections 1.0 through 3.0 of the Work Plan (WP) summarize the history of the Study Area and evaluations of available data regarding sediment and water column contamination. The Conceptual Site Model (CSM), which identifies the sources and mechanisms of potential contaminant release within the Study Area and the possible pathways whereby human and ecological receptors may be exposed to sediment contaminants, is provided in the Pathways Analysis Report (Battelle, 2004) and in Section 3.3 of the WP.

The current effort to be implemented for the Study Area and addressed in these planning documents includes both Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and WRDA objectives and is to obtain data to:

- Prepare the CERCLA RI/FS report for the Passaic River Study Area.
- Support a comprehensive, watershed-based plan to restore the functional and structural integrity of the Lower Passaic River ecosystem and to support broader, watershed-wide restoration efforts under WRDA.
- Support development of a NRDA under CERCLA to provide restoration for natural restoration for natural resources injured by contamination and to compensate for the public's lost use of those resources. (*e.g.*, recreational fishing).

At this time, the WRDA restoration efforts are primarily focused on the identification and screening of "candidate restoration sites." Suitable candidate restoration sites will be located in the Passaic River Estuary (*i.e.*, along the Lower Passaic River or along its tributaries), will be prioritized according to detected environmental contamination and other criteria (as identified in FSP Volume 3), and will be appropriate for wetland rehabilitation and other restoration efforts. In addition to wetlands, other habitat types such as mudflats and submerged aquatic vegetation may be targeted for restoration.

Field efforts to obtain the necessary data are expected to be conducted from the fall of 2004 through fall of 2007.

2.0 Identify the Decision

The principal RI/FS study questions to be answered include the following:

- What are the contaminants of potential concern (COPCs) and potential ecological concern (COPECs)?
- What is the extent and distribution of contaminants in sediment, surface water, and biota? Have the sources been identified? Are contaminants being exported from the Study Area? How could contaminant export be impacted by changing conditions?
- What are the quantitative human and ecological health risks posed by the contamination in the Study Area?
- Are the human health and ecological risks posed by the Study Area unacceptable [*i.e.*, the risk range identified in the National Contingency Plan (NCP) is exceeded], and consequently, is assessment of remedial action warranted via a FS?
- What is the comparative performance of remedial alternatives (including potential interim remedies), based on the CERCLA evaluation criteria?
- What are the relative risk reductions associated with the various remedial actions (including potential interim remedies) in relation to the baseline risks?

The remedial alternatives to be considered will include: a "no action" alternative; monitored natural recovery (MNR); sediment removal alternatives (*i.e.*, dredging), one or more of which may include ex-situ treatment; in-situ treatment; and capping.

While the CERCLA RI/FS effort will assess the type and amount of remediation necessary to reduce human and ecological health risks from contaminants at the site, the Trustees are assessing restoration requirements from natural resource injuries caused by these contaminants. The Trustees have been working closely with the RI/FS and WRDA efforts to ensure that the data collected under those efforts will also be useful for the NRDA to answer the following principal questions:

- Which of the public's natural resources are injured by the contaminants discharged by the responsible parties, and how much is injured?
- What is the pathway of the contaminants from their release to the injured resources?
- What is the appropriate type and amount of restoration needed to restore injured resources and compensate the public for their lost use?

The WRDA efforts require answers to the following principal questions:

- How should candidate restoration sites be prioritized for ecosystem rehabilitation, based on the "screening criteria" described in the Field Sampling Plan Volume 3 (refer also to Table 6)?
- What is the type, extent, and distribution of contamination in soil, sediments, groundwater, and/or surface water at the candidate sites?
- What is the appropriate restoration design for suitable candidate sites?
- What is the contaminant loading to the Harbor and what is the impact on dredged material management for the navigational dredging program?

Other WRDA projects may be proposed for the Study Area and associated principal questions developed to assess their feasibility.

The study questions are further modified by the "Fundamental Questions" listed below, which were developed by the project management team. Questions 1 through 3 were provided by USEPA in May 2004; questions 4 and 5 were proposed as the result of a brainstorming session held the morning of October 20, 2004 and attended by key project staff from Malcolm Pirnie and Battelle. Question 6 was also discussed at the brainstorming session and more recently included.

1. If we take no action on the River, when will the COPCs and COPECs recover to acceptable concentrations?[1]
2. What actions can we take on the River to significantly shorten the time required to achieve acceptable or interim risk-based concentrations for human receptors and ecological receptors?
3. Are there contaminated sediments now buried that are likely to become "reactivated" following a major flood, possibly resulting in an increase in contaminants within the fish/crab populations?
4. What actions can we take on the River to significantly improve the functionality of the Lower Passaic River watershed?[2]
5. If the human and ecological risk assessments for Newark Bay demonstrate unacceptable risks due to export of contaminants from the Passaic River, will the plan proposed to achieve acceptable risks for Passaic River receptors significantly shorten the time required to achieve acceptable or interim risk-based concentrations for human and ecological receptors in Newark Bay, or will additional actions be required on the Passaic River?[3]

[1] with "acceptable" as a determination of whether COPCs pose unreasonable risk to human health (based on cancer risks between 1E-06 and 1E-04, and noncarcinogenic health effects based on a hazard index greater than 1), and whether COPECs pose unreasonable risk to ecological health (based on an ecological risk hazard index greater than 1).

[2] with "significantly" requiring policy input

[3] Note that this question is a shared one with the RI/FS for the Newark Bay OU since the actual benefits of such reduction will need to be jointly determined; DQOs lay out the appropriate limits of investigation for the Study Area.

6. What action can be taken on the River to significantly improve the quality of navigational dredge materials in the New York/New Jersey Harbor?

The Fundamental Questions address major issues associated with the RI/FS study questions. For example, questions 1 and 3 are pertinent to the evaluation of a MNR alternative, in that they address sediment stability issues and the duration for MNR to reach acceptable contaminant concentrations. In addition, question 4 addresses WRDA issues that are to be considered along with the CERCLA RI/FS effort.

3.0 Identify the Inputs to the Decision

The following major inputs are required to answer the study questions identified in Step 2 of the DQO Process:

1. A hydrodynamic, hydrological, and biological model of the Study Area to facilitate evaluation of sediment and water column contaminant fate and transport.
2. Physical, hydraulic, hydrologic, hydrodynamic, and biological data to calibrate and validate the model of the Study Area.
3. Sediment and water column analytical data to establish the nature and extent of contamination.
4. Exposure assessment data to complete the human and ecological health risk assessments.
5. Physical and chemical data necessary for evaluation of remedial alternative performance in the Study Area (*e.g.*, debris survey and sediment geotechnical data required for dredging feasibility evaluation).
6. Remedial alternative performance data (*e.g.*, unit costs, short-term effectiveness, long-term effectiveness, implementability) to facilitate the comparative evaluation of alternatives for the FS.
7. Characterization of physical and chemical properties of environmental media at candidate restoration sites to evaluate the feasibility of WRDA restoration efforts.
8. Ancillary elements to facilitate data acquisition, presentation and analysis, such as site mapping, GIS, and PREmis project database.

4.0 Define the Boundaries of the Study

The physical boundaries of the RI/FS include the 17-mile reach of the Lower Passaic River Restoration Project Study Area, from Newark Bay to the Dundee Dam, including an assessment of the boundary conditions at its tributaries (*e.g.*, First River, Second River, Saddle River), the Hackensack River, and Newark Bay. The temporal boundaries of the RI/FS extend to include all historic data that meet the Data Quality Scheme of the Historical Surface Sediment Data Evaluation (Malcolm Pirnie, 2004), as summarized in

Section 3.0 of the WP, and the projected duration of the RI/FS field investigation effort (2004 through 2008).

The physical boundaries of the WRDA restoration effort encompass the Passaic River Estuary. For example, proposed candidate restoration sites may be located along tributaries to the Lower Passaic River, distant and up-estuary from the boundary condition sampling at the juncture of the tributary and the Lower Passaic River that generally marks the limit of the CERCLA RI/FS investigation.

5.0 Develop a Decision Rule

The following primary decision rules will be used to answer the principal study questions of the CERCLA RI/FS and WRDA efforts:

1. If the human carcinogenic risk exceeds the NCP risk range of 1×10^{-4} to 1×10^{-6} and/or the non-carcinogenic hazard index exceeds 1, then the portion(s) of the Study Area associated with the unacceptable human health risks will be considered for remedial action.
2. If the ecological risk hazard index exceeds 1, then the portion(s) of the Study Area associated with the unacceptable ecological health risks will be considered for remedial action.
3. Applicable CERCLA and WRDA remedial alternatives (including the no action alternative and interim remedies) will be comparatively evaluated according to the CERCLA evaluation criteria. Based on criteria and weightings to be developed, evaluation scores will be prepared for the various remedial alternatives.
4. WRDA Candidate Restoration Sites will be prioritized for restoration based on the detected environmental contamination.

6.0 Specify Limits on Decision Errors

The general types of decision errors that may be encountered on this project are listed below along with examples of mitigative measures.

1. Laboratory Analytical Errors. It is possible that laboratory analytical data will include false negative results (low bias) or false positive results (high bias). These types of errors could lead to an underestimate of contaminated areas/inadequate remedial action or an overestimate of contaminated areas/unnecessary remedial action, respectively. Laboratory analytical errors will be controlled by establishing appropriate controls for data quality (*e.g.*, initial and continuing calibration verification standards, internal standard and surrogate recoveries, laboratory control samples, *etc.* as appropriate for each analysis) and validating the resultant data to evaluate potential bias. The project team will consider the validation results during remedial decision making.

2. Laboratory Analytical Sensitivity. Improper specification of reporting limits (RLs) could reduce the usability of the collected data for RI/FS decision making. Required RLs were carefully selected for the dual objectives of human health/ecological risk assessment sampling and examination of the spatial distribution of sediment contamination. Consideration of risk assessment "effects levels" and likely remediation goals, respectively, were the basis of RL requirements.

3. Field Screening Errors. A number of screening analyses [field bioassay, field x-ray fluorescence (XRF), and rising/falling tide surveys] are under consideration to locate source areas/"hot spots". Due to uncertainty and potential bias in the field analytical techniques and based on the selected spatial scale of the survey techniques (*e.g.*, frequency of water column sampling during rising/falling tide surveys), some contaminant source areas may go undetected. Potential bias in bioassay and XRF field screening will be controlled by confirmatory lab analyses to correlate field screening results with laboratory analytical data. In addition, survey efforts will be implemented in an iterative manner (*e.g.*, subsequent rising/falling tide surveys will adjust sampling locations and frequency based on the review of the results of the initial survey).

4. Sediment Core Sampling Density. The proposed size of the sediment core sample population must be adequate to characterize the Study Area. During design of the 2006 Low Resolution Sediment Coring Program, USEPA Decision Error Feasibility Trials (DEFT) software will be used to evaluate the necessary sample population to provide acceptable percentages of Type I (false positive) and Type II (false negative) errors, considering the statistical distribution and variance of the historic data set. This evaluation will be updated after implementation of the low resolution sediment coring program to establish a basis for potentially required data gap coring efforts.

5. Modeling Errors. Potential errors in the hydrodynamic and sediment fate and transport modeling will impact remedial decision making. For example, errors in the rates selected for sediment deposition and/or scour could lead to inappropriate conclusions regarding the potential burial of contaminated sediments, possibly causing inadequate remediation. Modeling errors will be controlled by evaluating direct measurements of parameters whenever possible (such as evaluation of depositional chronology from high resolution sediment cores and SedFlume testing) and by testing the model's skill at prediction of known parameters. The nature of future development in the Study Area may also impact the effectiveness of the model's predictions (70-year prediction to be examined). To control this source of error, data gathered via WRDA real estate and socioeconomic investigations will be assessed to characterize likely future development in and around the Study Area.

6. Geophysical Survey Error. The geophysical data from the side scan sonar (SSS) and sub-bottom prove-out will be evaluated by an experienced marine geophysicist to assess the utility of the obtained data. If the geophysical methods are not found to be applicable for the Lower Passaic River, alternate methods will be evaluated to address the associated study questions (*e.g.*, magnetometer and/or underwater camera surveys may be implemented to identify debris targets that could impact dredging feasibility) and/or the study questions will be fulfilled to the greatest extent possible by other programmed investigations (*i.e.*, if sub-bottom surveys are not found to be useful, the

physical description of sediment stratigraphy will be assessed primarily through examination of sediment cores).

7. Errors in Mass Balance/Evaluation of External Loads. Potential errors in estimates of external contaminant loads to the system will result in errors/uncertainty in the contaminant mass balance and remedial decision making for the Study Area. For example, CSO sampling during storm events may not adequately represent unknown and intermittent industrial discharges. The sampling design will be optimized, where possible, to obtain the most representative samples, and in this example, it may be possible to sample sludge within the combined sewer system to attempt to further characterize the spectrum of contaminants/discharges present in the system. Errors will also be controlled by iterative sampling events and by considering each line of evidence (results of CSO, rising/falling tide, water column, and sediment sampling events) that address the potential impacts of point source discharges within the Study Area.

8. Errors/Uncertainty in Risk Assessment. If risks associated with site-related exposures are overestimated (*i.e.*, false positive), a potential consequence is unnecessary remedial work that could itself be biologically detrimental. If risks are underestimated (*i.e.*, false negative), a possible consequence is to fail to conclude that remedial action is required, resulting in continuing potential for adverse effects to human and ecological health. To control for these possible errors, exposure parameters will be carefully selected to represent Reasonably Maximally Exposed individuals. The Trustees' natural resource damage assessment will include site specific studies of injury and exposure, where possible. That information may also be useful in the RI/FS risk assessment to control for errors.

9. Errors/Uncertainty in Remedial Alternative Performance Data. The comparison of remedial alternatives for the FS effort requires the assessment and weighting of remedial alternative performance data (*e.g.*, ex-situ treatment cost per ton, percent reduction in contaminated volume). This data is primarily obtained from literature, seminar presentations, and interviews with USEPA and other agency project management staff. Errors in reported performance data will skew the comparative evaluation of alternatives and could lead to a less than optimal recommended alternative. Decision errors will be controlled by conducting a literature survey to identify and compare multiple sources of performance data, where possible, and by considering the findings of Passaic River pilot study efforts conducted by NJDOT-OMR and the USEPA and the In-situ Stabilization Pilot conducted by NJDOT-OMR.

7.0 Optimize the Design for Obtaining Data

The field investigation design, developed to serve RI/FS, WRDA, and NRDA processes, was optimized by developing broad investigation topics, associated subtasks/decision rules, and required tasks/inputs for each of the proposed field investigation and data gathering efforts, are presented in Attachment 1.1 as Tables 1 through 6. The topics and associated tasks were developed to guide the design of the field investigations and ensure that the effort meets the needs of Steps 2 and 3 of the DQO process, as described above.

The information within Tables 1 through 6 is grouped by general categories of data needs, as listed below:

- Table 1 – Site Physical Characteristics.
- Table 2 – Nature and Extent of Contamination.
- Table 3 – Human Health Risk Assessment.
- Table 4 – Ecological Risk Assessment.
- Table 5 – Expected Performance Requirements of Treatment Alternatives.
- Table 6 – WRDA Restoration Efforts.

TABLE 1. SITE PHYSICAL CHARACTERISTICS

BROAD TOPICS	SUB-TOPICS and DECISION RULES	TASKS and INPUTS
What are the hydrologic, hydrodynamic, and sediment transport characteristics of the Study Area? How can these characteristics support the development of a hydrodynamic, sediment transport, and contaminant fate and transport model?	1. What are the major hydrodynamic and hydrological factors that affect the distribution of the COPCs and COPECs? Decision Rule: Sufficient data is to be collected such that the hydrodynamic model can be calibrated and validated.	1A. Baseline, fixed-point, time series water column data (e.g., water levels, temperature, and salinity) for calibration of the hydrodynamic components of the model. Total suspended solids (TSS), particulate organic carbon (POC), dissolved organic carbon (DOC), and grain size measurements under varying tidal conditions, upstream river discharge, and stratification.
		1B. Water quality data collected from instruments installed on permanent moorings, including current velocity data from Acoustic Doppler Current Profilers, conductivity and temperature data from probes, and turbidity data from Optical Backscatter Sensors.
		1C. Results of CTD surveys (salinity, temperature, and pressure data) supplemented by sampling for suspended sediment concentration, total dissolved salts, conductivity, POC, grain size, TSS, and volatile suspended solids (VSS). Vertical profile data collected at NJDOT-OMR mooring sites including TSS, total dissolved salt, conductivity, and water density. Vertical profile data collected at Superfund mooring sites for TSS, VSS, and conductivity.
		1D. Results of detailed tidal cycle surveys (including dye studies) conducted by NJDOT-OMR in the Harrison Reach to characterize the spatial structure of currents, stratification, and bottom shear stress in the vicinity of the pilot dredging study area, supplemented by water sampling for TSS, dissolved salt, conductivity, and grain size. Results of Superfund cross-sectional surveys at neap and spring tides supplemented by water sampling for TSS, VSS, conductivity, and grain size.
		1E. USGS characterization of surface water above the Dundee Dam for TSS, VSS, grain size of suspended solids in water samples, POC, Be-7, and Th-234. Data from flow gauges at Dundee Dam. Information on loads from CARP database. Refer also to Contaminant Mass Balance in Table 3.
	2. What control structures (*e.g.* , dams, locks, tide gates) are present in the Passaic River and adjacent waterways and how do they need to be considered in hydrodynamic evaluations/ modeling efforts? Decision Rule: The function/effects of control structures identified in the Study Area must be appropriately accounted for in the hydrodynamic and sediment transport models.	2A. Identify control structures, if present.
		2B. Evaluate effects of control structures on study area, if applicable.
	3. How will sediment erosion and depositional mechanisms (including storm events and tidal influences) in the Passaic River affect the fate and transport of contaminated sediment, COPCs, and COPECs (*e.g.* , will burial of contaminated sediment by new sediment impact recovery/natural attenuation)? What are the geotechnical properties of sediments in the Lower Passaic River and its tributaries, adjacent waterways (*e.g.* , Hackensack River) and their tributaries, Newark Bay, and flood plain areas? Decision Rule: Sufficient data is to be collected such that the sediment transport model can be calibrated and validated	3A. Grain size distribution (sieve and hydrometer analyses; LISST; Malverne Mastersizer), bulk density, dry density, porosity, organic carbon content from sediments of the Passaic River and its tributaries, adjacent waterways and their tributaries, Newark Bay, and the floodplain. Sediment samples are to be collected during geophysical surveying and/or low resolution sediment coring programs.
		3B. Bed properties of Passaic River and its tributaries, adjacent waterways and their tributaries, Newark Bay, and floodplain areas from historic data and RI/FS sampling programs, including sediment sample analyses and geophysical surveys.
		3C. Soil geotechnical properties in riverbank areas.
		3D. Sediment and erosion depositional mechanisms from dredging pilot study results.
		3E. Location and depth to sediment from bathymetric survey, results of radiological analysis of surface sediment samples for Be-7 and Th-234, characterization of recent sedimentation rates and patterns using Cs 137 and Pb-210 profiles, sediment properties (organic carbon, bulk density, moisture content); evaluation of sediment erosion rates using SedFlume and Gust Microcosm erosion testing devices, evaluate in-situ settling/flocculation of sediment using a Modified Valeport Settling Tube, LISST/OBS and a video settling tube.
What are physical features of the Study Area, including upland topography, river bathymetry, stratigraphy, and habitat?	4. What is the bathymetry of the Lower Passaic River and its tributaries, adjacent waterways and their tributaries, and Newark Bay? What is the utility of geophysical investigations (side scan sonar and sub-bottom profiling) in the Lower Passaic River for identification of sediment type, stratigraphy, and debris targets? Decision Rules: • If comparison of historic bathymetric data to 2004 data indicates significant changes in river bed elevation (=2 feet), the usability of historic sediment data will be qualified appropriately and the design of the Low Resolution Coring Program adjusted accordingly. • If review of geophysical data from the side scan sonar (SSS) and/or sub-bottom prove-out is deemed usable by a marine geophysicist, appropriate geophysical surveys will be extended over the full Study Area, to the extent practical. • If surface sediment type mapping obtained from the SSS survey correlates with chemical data on the extent of COPCs and COPECs, the mapping will be used as an additional line of evidence for the determination of the horizontal extent of contaminated sediment. • If subsurface sediment stratigraphic mapping obtained from the sub-bottom survey correlates with chemical data on the extent of COPCs and COPECs, the mapping will be used as an additional line of evidence for the determination of the vertical extent of contaminated sediment.	4A. Bathymetric survey data and mapping in hardcopy and electronic formats, including USACE and TAMS 2004 data and digitized (not scanned) versions of USACE 1989, TSI 1999, and TSI 2000 bathymetric surveys.
		4B. Identification of potential deposition and scour areas.
		4C. Identification of potential bathymetric changes associated with historic storms (*e.g.* , Hurricane Floyd), based on comparison of TSI 1999, TSI 2000, and USACE 2004 bathymetric survey data.
		4D. Side scan sonar (SSS) and sub-bottom survey data from a limited number of “prove-out” locations.
		4E. “Ground truth” sediment near-surface cores and deep cores for calibration of the SSS and sub-bottom data, respectively and collection of sediment geotechnical data.
		4F. If SSS is implemented, the texture of surficial sediments (*e.g.* , ripple patterns, debris patterns).
		4G. If SSS is implemented, the amount/extent of debris and other targets (*e.g.* , utilities, wrecks) in the Passaic River for evaluation of the feasibility of remedial dredging and the feasibility of achieving restoration objectives at a particular site.
		4H. If sub-bottom surveying is implemented, the sediment stratigraphy below the Study Area riverbed.
	5. What are the physical features and topography of upland project areas adjacent to the Lower Passaic River, including the [10, 20, 100] -year flood plains? What is the wetland boundary in the Meadowlands? Decision Rule: Obtain survey data and mapping to adequately characterize the Study Area for RI/FS preparation.	5A. Land surveying and aerial photography field data.
		5B. Topographic maps at 1 inch = 30 ft scale that meet ASPRS Class 3 Map Accuracy for investigation planning and subsequent visual presentation of RI/FS data.
		5C. Shoreline and planimetric electronic data in AutoCAD and ArcGIS electronic formats.
		5D. Land use, vegetation types, urban characteristics, etc. of floodplain area adjacent to the Passaic River and its tributaries, adjacent waterways and their tributaries, and Newark Bay.
	6. What cultural resources, or significant or unique habitats and communities might be disturbed by remedial action (*e.g.* , submerged aquatic vegetation, wetlands, threatened or endangered species)? Decision Rule: Adequate data will be obtained on the presence/absence of cultural resources and significant or unique habitats and communities to assess their impact on remedial implementation and feasibility.	6A. Identification of significant cultural resources in the Study Area.
		6B. Delineation and assessment of submerged aquatic vegetation (SAV), wetland, and shoreline habitats.
		6C. Identification of threatened or endangered species or unique communities/populations.

	BROAD TOPICS	SUB-TOPICS and DECISION RULES	TASKS and INPUTS
TABLE 2. NATURE AND EXTENT OF CONTAMINATION	What are the COPCs and COPECs in the Study Area environmental media? What is the current spatial distribution of COPCs and COPECs concentrations in the river sediments, both horizontally and vertically?	7. What is the current inventory of COPCs and COPECs in the river? What fraction of this inventory is or will become available over time? What is the most upstream point potentially impacted by contaminants released in the saline (brackish) portion of the estuary? What is the potential contribution of this inventory to the harbor and Newark Bay? Decision Rules: • Contaminants will be identified as COPCs if they meet the criteria in Section 5.1 of the PAR. • Contaminants will be identified as COPECs if they meet the criteria in Section 6.1 of the PAR. • Estimated availability of inventory and upstream transport to be evaluated via hydrodynamic and sediment transport model output.	7A. Volatile organic, semivolatile organic/PAH, pesticide, inorganic, acid-volatile sulfide/simultaneously extractable metals, dioxin/furan, and PCB congener concentrations in surface and subsurface sediments, as determined via RI/FS low resolution and high resolution sediment coring programs. Some sampling locations to be co-located with geotechnical samples collected to characterize sediment bed properties (refer to Task 3A). Frequency of detection of each parameter. 7B. Volatile organic, semivolatile organic/PAH, pesticide, inorganic, dioxins/furans, and PCB congener surface water concentrations from RI/FS water column sampling (*e.g.* , data from moorings, fixed station monitoring, rising/falling tide surveys, and/or event sampling). The collected samples should be coordinated with other surface water quality measurements such as TSS analyses (refer to Tasks 1A through 1E). Frequency of detection of each parameter. 7C. Historical sediment and water quality data. 7D. Hydrodynamic and sediment transport model runs to evaluate availability and transport of contaminant inventory over time. 7E. Risk-based criteria and/or PRGs, lists of Class A carcinogens, etc.
		8. What is the horizontal and vertical extent of the contaminated sediments (unacceptable COPC and COPEC concentrations) in the Study Area? Decision Rule: Contaminant concentrations exceeding project-specific action levels (to be determined) will be geostatistically analyzed along with sediment type data from geotechnical and geophysical surveys to establish the extent of contaminated sediments requiring remediation.	8A. Data from "Identify COPCs/COPECs" (Tasks 7A through 7E above). 8B. Results of screening investigations (*e.g.* , rising/falling tide surveys, "underway" sediment surveys, XRF sediment field screening, and immunoassay sediment analyses) that employ rapid field surveys of water and sediment quality to identify the locations of potential contaminated sediment deposits and target these areas for subsequent low resolution sediment coring. For example, rising/falling tide surveys involve the collection of water column samples to identify spatial variation in detected surface water contaminant concentrations as an indicator of the potential location of contaminated sediment deposits. 8C. "Data gap" low resolution sediment coring results based on geostatistical and judgmental sampling based on data from Task 8B. 8D. Comparison of historic and current bathymetric mapping to identify whether storm events or other mechanisms (*e.g.* , Hurricane Floyd of 1999) redistributed contaminated sediments, necessitating recharacterization of previously sampled areas. 8E. Historical sediment characterization data that meet project quality standards and are deemed to be representative of current conditions (evaluation criteria to include review of co-located low resolution sediment core sample data). 8F. A description of contaminated sediment depositional chronology from the high resolution sediment coring program. Radionuclide dating results from finely segmented cores. Chemical concentration data from selected high resolution sediment core segments based on radionuclide dating. 8G. Low resolution sediment core and mudflat sediment core results for geostatistical and/or other spatial analyses. 8H. Maps of sediment physical properties (*e.g.* , grain size, geologic description, stratigraphy from core descriptions and sub-bottom profiling, if applicable) where field data indicate a correlation between contamination and specific physical properties (such as fine-grained sediments) based on Tasks 4A through 4H.
	What are the major sources and processes controlling COPC and COPEC distribution in the Lower Passaic? What is the COPC and COPEC mass balance?	9. What are the major external sources of the COPCs and COPECs to the Lower Passaic? • What are the loads at the Dundee Dam? • What are the loads contributed by the tributaries? • What are the loads contributed by CSOs and sewer discharges? • What are the loads contributed by direct industrial discharges? • What are the magnitude and the direction of the net tidal transport in the river? • What is the magnitude of gas exchange and dry and wet atmospheric deposition? • What are the magnitude and the direction of the net ground water transport in the river? Decision Rules: • Sufficient data will be collected to characterize contaminant loads at Study Area boundaries. • Sufficient data will be collected to characterize discharges (*e.g.* , CSOs) to the Study Area. • Sufficient data will be collected to characterize other sources of contaminants (*e.g.* , atmospheric deposition) and complete the mass balance for the Study Area.	9A. Results from time series fixed transect water column monitoring in the Lower Passaic River; at boundaries with tributaries, Newark Bay, and the Hackensack River; and from rising/falling tide surveys (refer also to Task 1A). CSO and WWTP sampling efforts (to be conducted by others). 9B. Results of hydrogeological investigations and modeling. 9C. Results of atmospheric deposition investigations including wet and dry deposition, emission records, and air-water interface concentrations for estimating deposition/volatilization. 9D. Completion of the preliminary mass balance calculations and sensitivity analyses.
		10. What are the major internal processes affecting COPCs and COPECs? • What are the contributions of sediment resuspension and deposition (from storms, bioturbation, tidal action, etc.), adsorption and desorption, porewater diffusion and porewater displacement (groundwater movement)? • What other in-river processes may be important (photolysis, hydrolysis, precipitation, biodegradation, weathering)? Decision Rules: • Sufficient data will be collected to characterize contributions to water column contamination due to bioturbation and porewater releases. • Calibrated and validated model output will be used to forecast the impacts of other in-river processes on COPCs and COPECs.	10A. Results of bioturbation sampling, porewater sampling (*e.g.,* "peepers"), and hydrogeological investigations (see Task 9B). 10B. Results of model output regarding sediment transport associated with storm events, tidal action, etc. and the impacts of other in-river processes on the fate and transport of COPCs and COPECs.
		11. How have the external and internal sources varied over time and how are they likely to vary in the future? How will external loads be expected to vary? What factors govern the internal loads and how will these vary? Decision Rule: Sufficient data will be collected to characterize internal and external sources and loads to calibrate the hydrodynamic and sediment transport models and prepare a cohesive geochemical evaluation of the Study Area.	11A. Depositional chronology data from high resolution sediment coring program. 11B. Low resolution sediment coring analytical data, fixed location and rising/falling tide water column sampling analytical data, and hydrodynamic and sediment transport model output. 11C. Historic data from literature regarding sources and characterization of contaminant loads. Evaluation of historic data via calculation of ratios between various contaminants, PCB congeners, and dioxins; reconciliation of unique contaminant signatures, water column concentrations, and solids transport data for various sources (*e.g.* , tributaries, discharges).
		12. What is the rate at which each COPC/COPEC attenuates (including biodegradation and weathering mechanisms), is exported, or becomes unavailable from locations along the river? Decision Rule: Geochemical evaluation of RI/FS and historic data, information from the literature, and calibrated model output will be used to evaluate the potential for natural attenuation of COPCs and COPECs.	12A. Evaluation of sediment and water column analytical data for evidence of biodegradation and natural attenuation mechanisms and contaminant breakdown products. 12B. Literature information on COPC and COPEC natural attenuation and biodegradation.

TABLE 3. HUMAN HEALTH RISK ASSESSMENT

	BROAD TOPICS	SUB-TOPICS and DECISION RULES	TASKS and INPUTS
	What is the current and future human health risk associated with exposure to sediment, surface water, and/or consumption of edible portions of fish or shellfish? (Potential risks for consumption of other species (*e.g.* , waterfowl) will be evaluated qualitatively.	13. Are the environmental data for sediment, surface water, and biological tissue of acceptable quality for use in estimating human health risks? Decision Rule: Based on the outcome of the data usability evaluation, retain those data determined to be of acceptable quality for use in risk assessments, otherwise eliminate. For retained analytical results, if data sets are comparable (based on criteria specified in the data usability evaluation), then combine for use in risk assessment; otherwise, select the subset(s) that best meet DQOs.	13A. Evaluate data usability of relevant environmental media including quality of data with respect to: sample quantitation limits, qualifiers and codes, blanks, and tentatively identified compounds (TICs). Evaluate data comparability by examining analytical methods, QA/QC procedures, and similarity of results.
		14. Is the spatial coverage of COPCs adequate to quantify human health exposures with a specified level of confidence? Decision Rule: If the spatial coverage of risk assessment data within each defined area/habitat is adequate to meet the objectives (with respect to spatial and statistical requirements) developed during the sample design phase, then calculate exposure point concentrations (EPCs); otherwise, collect additional analytical data to address data gaps.	14A. Evaluate adequacy of spatial coverage within each exposure area/unique habitat with respect to sampling needs identified in the sample design phase.
		15. Do current or projected future COPC concentrations in sediments from the Passaic River pose an unacceptable health risk [exceeding the NCP risk range defined as a cancer risk >1E-04 to 1E-06 and/or a non-cancer hazard index (HI) >1] to human receptors? Decision Rule: If estimated cumulative human exposure results in an unacceptable health risk (*i.e.* , a cancer risk >1E-06 and/or a non-cancer HI>1), then further evaluation of remedial options or restoration will be considered as part of the FS process.	15A. Identify appropriate exposure scenarios and population groups based on the human health conceptual site model. 15B. Identify COPCs in sediment and water based on a risk-based contaminant screening process. 15C. Calculated potential carcinogenic risks and noncarcinogenic hazard indices for direct exposures to sediment. Cancer risks and hazard indices will be calculated for both current and predicted future conditions. Calculations will be based on concentrations of COPCs in surface sediments and water from the Passaic River. Concentrations may be based on: (a) current analytical measurements for surface sediments; (b) current analytical measurements for sediment at depth that may be exposed in the future; (c) results of sediment modeling exercises. 15D. Emerging chemicals of potential concern as identified by USEPA will be considered as COPCs in the Study Area.
		16. Do current or projected future COPC concentrations in tissues of fish and shellfish from the Study Area pose an unacceptable health risk (defined as a cancer risk >1E-06 and/or a non-cancer HI>1) from consumption by human receptors? Decision Rule: If estimated cumulative human exposure results in an unacceptable health risk (*i.e.* , a cancer risk >1E-06 and/or a non-cancer HI>1), then further evaluation of remedial options or restoration will be considered as part of the FS process.	16A. Identify appropriate exposure scenarios and population groups. 16B. Identify COPCs in edible portions of fish and shellfish based on a risk-based contaminant screening process. 16C. Determine appropriate site-specific exposure factors. 16D. Calculate potential carcinogenic risks and noncarcinogenic hazard indices for direct exposures to consumption of fish and shellfish. Risk and hazard indices will be calculated for both current and predicted future conditions. Calculations will be based on concentrations of COPCs in edible fish and shellfish tissue. Concentrations may be based on: a) current analytical measurements for fish and shellfish species collected from the Study Area; b) estimated tissue concentrations based on food web modeling using current or predicted sediment concentrations.
		17. Do current or projected future COPC concentrations in tissues of potential edible species (*e.g.* , waterfowl) from the Study Area pose an unacceptable health risk (defined as a cancer risk >1E-06 and/or a non-cancer HI>1) from consumption by human receptors? Decision Rule: If estimated cumulative human exposure results in an unacceptable health risk (*i.e.* , a cancer risk >1E-06 and/or a non-cancer HI>1), then further evaluation of remedial options or restoration will be considered as part of the FS process.	17A. Identify appropriate exposure scenarios and population groups (*e.g.* , children and subsistence fish consumers). 17B. COPCs in water and edible portions of other species (*e.g.* , waterfowl) based on a risk-based contaminant screening process. 17C. Calculated potential carcinogenic risks and non-cancer hazard indices for consumption of other edible species (*e.g.* , waterfowl). Cancer risks and hazard indices will be calculated for both current and predicted future conditions. Calculations will be based on concentrations of COPCs in edible species (*e.g.* , waterfowl). Concentrations may be based on: (a) current analytical measurements for fish and shellfish species collected from the Study Area; (b) estimated tissue concentrations based on food web modeling using current or predicted sediment concentrations.

TABLE 4. ECOLOGICAL RISK ASSESSMENT

	BROAD TOPICS	SUB-TOPICS and DECISION RULES	TASKS and INPUTS
	What is the current ecological risk associated with exposure to sediment and porewater and/or consumption of edible portions of fish, shellfish, or other edible species (e.g. waterfowl)?	18. Are the environmental data for sediment, surface water, and biological tissue of acceptable quality for use in estimating ecological risks? Decision Rule: Based on the outcome of the data usability evaluation, retain those data determined to be of acceptable quality for use in risk assessments; otherwise eliminate. For retained analytical results, if data sets are comparable (based on criteria specified in the data usability evaluation), then combine for use in risk assessment; otherwise select the subset(s) that best meet DQOs.	18A. Evaluate data usability of relevant environmental media including quality of data with respect to: sample quantitation limits, qualifiers and codes, blanks, and TICs. Evaluate data comparability by examining analytical methods, QA/QC procedures, and similarity of results.
		19. Is the spatial coverage of COPECs adequate to quantify ecological exposures with a specified level of confidence? What is the biologically active zone? Decision Rule: If the spatial coverage of risk assessment data within each defined exposure area/habitat is adequate to meet the objectives (with respect to spatial and statistical requirements) developed during the sample design phase, then calculate EPCs; otherwise, collect additional analytical data to address data gaps. Evaluate weight of evidence to determine depth of the biologically active zone.	19A. Evaluate adequacy of spatial coverage within each exposure area/unique habitat with respect to sampling needs identified in the sample design phase. 19B. Obtain sediment profile imagery (SPI), conduct preliminary grab sampling for benthic organisms, obtain vertical profile of oxidation-reduction potential in near-surface sediments.
		20. Do current or projected future COPEC concentrations in sediments from the Study Area pose an unacceptable risk to ecological receptors of concern either (a) directly exposed to contaminants in sediment, porewater, and/or surface water or (b) exposed to contaminants through the food web? Decision Rule: For each assessment endpoint, determinations of risk and magnitude of risk (*i.e.* , high or low magnitude) will be provided in the Field Sampling Plan Volume 2. This will also include the process for integrating each line of evidence into the weight-of-evidence process to interpret the risk findings.	20A. Develop Ecological Conceptual Site Model that depicts contaminant sources, potential migration pathways, exposure pathways, and receptors of concern (ROCs). Select ROCs based on degree of contact with sediment/mudflats, dietary preferences, and habitat suitability. Inputs include data from historical and planned habitat population surveys (under WRDA); in addition, consideration to possible restoration objectives that could results in the re-establishment of extirpated populations within the Study Area.
			20B. Identify COPECs by a screening process identified in the PAR. Comparisons of historical, current, and any future contaminant concentrations will be made to COPEC screening benchmarks for both bioaccumulative and non-bioaccumulative contaminants.
			20C. Estimate concentrations of COPECs in surface sediments and porewater from the Study Area. Concentrations may be based on: (a) current/future analytical measurements for surface sediments and porewater; (b) current/future analytical measurements for sediments at depth that may be exposed in the future; and (c) modeling output.
			20D. Estimate concentrations of COPECs in surface water in the Study Area. Concentrations may be based on current/future analytical measurements for water and the results of hydrodynamic modeling.
			20E. Estimate concentrations of COPECs in prey items consumed by upper trophic level ROCs. Concentrations may be based on: (a) current/future analytical measurements of fish and prey species collected from the Study Area; (b) estimated tissue concentrations based on food web modeling using current or predicted sediment concentrations.
			20F. Ecological effects data may be obtained using a variety of methods including, but not limited to, dose-response studies reported in the literature, site-specific laboratory bioassays, and population- and community level bioassessment studies conducted in the Study Area.
			20G. Quantify risk estimates using hazard ratio methods (*e.g.* , comparison of NOAELs/LOAELs to exposure concentrations).

	BROAD TOPICS	SUB-TOPICS and DECISION RULES	TASKS and INPUTS
TABLE 5. EVALUATION OF REMEDIAL ALTERNATIVES	What is the optimal remedial alternative to address unacceptable human health and/or ecological risks at the Study Area?	21. Has sufficient data been collected to comparatively evalute remedial alternatives, including no action, monitored natural recovery, removal, in-situ treatment, or capping? What interim remedies are desirable and feasible (if any)? Decision Rule: Applicable remedial options (including no action) will be comparatively evaluated according to the CERCLA evaluation criteria and assigned weightings. The remedial alternative with the most favorable combined weighting will be recommended for implementation.	21A. Contaminant concentrations from historic data and RI/FS field investigations, horizontal and vertical extent of contamination, and extent of contaminant migration (including an evaluation of sediment stability). 21B. Dredge performance and monitoring data from the Environmental Dredging Pilot Study and data obtained from literature searches. 21C. Treatability data from the Passaic Sediment Decontamination Technology Pilot, NY/NJ Harbor Sediment Decontamination Program, OMR In-situ Stabilization/Deep Soil Mixing Pilot Studies and data obtained from literature searches. 21D. Performance criteria for other in-situ/ex-situ treatment alternatives proposed to reduce the toxicity, volume, or mobility of sediment contaminants. 21E. Material handling and physical properties of contaminated sediments from the Passaic River in regard to sediment dewatering and treatment issues, from geotechnical and geophysical programs.
		22. How will the presence of debris, cultural resources, recreational resources, sensitive habitats, the volume and extent of contaminated sediment, and the physical/geotechnical and chemical properties of the contaminated sediment impact the feasibility of dredging and other remedial alternatives? Decision Rule: The amount and nature of debris and sediment geotechnical properties will be considered to evaluate the implementability of a dredging alternative.	22A. Debris assessment from SSS and potentially a magnetometer survey. 22B. Location and type of cultural resources and sensitive habitats from Task 6. 22C. Volume and extent of contaminated sediment and sediment properties from Task 8 and Task 21 above. 22D. Assessment of recreational resources that could be disturbed by remedial action.
		23. What is the forecasted reduction in human and ecological risk for various remedial alternatives (e.g., minimization of contaminant export from a particular location), including interim remedies, and over what future duration? Decision Rule: The estimated reduction in risk for each remedial alternative evaluated will be considered as part of the assessment of short-term and long-term effectiveness of the alternative.	23A. Human and ecological risk assessments for various remedial scenarios.
		24. Will contaminant loading to and from sources outside the Lower Passaic River (LPR) recontaminate the Passaic River to an unacceptable level following a potential sediment remediation action in the Passaic River? Decision Rule: Model output will be used to estimate the potential for recontamination of remediated portions of the Study Area due to external loads. Projections of potential recontamination will be weighed in the evaluation of remedial alternatives.	24A. Mass balance data and characterization of external contaminant loads to the Study Area from Task 9.
		25. How will the availability of disposal sites/placement sites (*e.g.* , upland sites, CDFs) and their acceptance criteria impact the feasibility of remedial dredging? Is decontamination and production of beneficial use products an option? Decision Rule: The availability of dredged sediment disposal sites and availability of decontamination/reuse facilities will be considered during assessment of the implementability of a dredging/sediment removal alternative.	25A. Telephone and literature survey of CDF status, permit acceptance criteria, treatment types available and performance data. Telephone and literature survey of facilities that can produce beneficial use products.
		26. What are the RCRA disposal characteristics of contaminated sediments from the Passaic River? Decision Rule: Sediment analytical results will be compared to RCRA action levels for characteristics of toxicity, reactivity, corrosivity, ignitability and other disposal criteria. Assessment of disposal characteristics will be used to evaluate implementability and estimated cost of remedial alternatives.	26A. TCLP extract concentrations from sediment samples. 26B. Geotechnical and wet chemical analyses including moisture content, TOC, and paint filter test analyses. 26C. Survey of currently available and potential future dredged sediment disposal sites from Task 25.

TABLE 6. WRDA RESTORATION EFFORTS

	BROAD TOPICS	SUB-TOPICS and DECISION RULES	TASKS and INPUTS
	What is the suitability of candidate sites for WRDA restoration efforts? Collect data needed to support development of a restoration project concept design and analysis via environmental investigations, habitat evaluation procedures, hydrogeomorphic approach, and rapid bioassessment protocols.	27. Do the detected concentrations of chemical contaminants in the candidate restoration site environmental media exceed NJDEP Technical Site Remediation Standards, reference values, and/or other ARARs? Are the detected concentrations of contaminants likely to have an adverse impact on site restoration (*e.g.* , plantings, biota)? Decision Rule: The detected concentrations of environmental contaminants at candidate sites will be considered in the prioritization of sites for WRDA restoration efforts. The following categories of restoration opportunities are envisioned: • Clean sites removed from future influence of river contamination (*e.g.* , upland or upstream site) that can be "fast-tracked" for restoration. • Isolated contaminated sites that have a remediation phase, but which is independent of remedial action for Study Area (*e.g.* , contaminated upland site). • Contaminated sites dependent on the Study Area remedy (restoration to be implemented post Study Area remediation).	27A. TCL/TAL (PAHs only for semivolatile fraction), cyanide, PCB congener, and dioxin/furan concentrations in surface and subsurface soils and sediments. 27B. TCL/TAL (PAHs only for semivolatile fraction), cyanide, PCB congener, dioxin/furan, and TOC concentrations in groundwater and surface water. 27C. NJDEP Site Remediation Criteria, ecotoxicological benchmarks, reference values, and ARARs for evaluation of environmental media analytical results 27D. Candidate Site Restoration chemical screening criteria, consisting of ecological risk-based action levels for adverse impacts on biota and plantings associated with proposed restoration plan
		28. What is the appropriate restoration design for suitable candidate sites (*e.g.* , horticultural design and planting, aesthetics, channel layout) based on site-specific findings? Decision Rule: Sufficient data on site physical features will be collected to support the development of an appropriate restoration design.	28A. Elevations and topographic features of the candidate restoration sites from land surveying and aerial photography field activities. 28B. Geotechnical properties of candidate site soils/sediments to support restoration feasibility analyses. 28C. Grades of the side slopes of the Passaic River and/or its tributaries at candidate restoration sites (for possible design of bank stabilization/regrading measures associated with restoration). 28D. Site access characteristics and the locations of utilities and other features. 28E. Topographic maps at 1 inch = 30 ft scale that meet ASPRS Class 3 Map Accuracy. 28F. Shoreline and planimetric electronic data in AUTOCAD and ARCGIS electronic formats. 28G. Characterization of groundwater and surface water elevations, fluctuations, and flow directions/regimes to understand the hydrologic factors that may affect restoration feasibility analyses. 28H. Assessment of cultural resources present at candidate restoration sites that could be disturbed by rehabilitation efforts. 28I. Characterize the socioeconomic characteristics of the Passaic River watershed area to support WRDA candidate restoration site decision making. 28J. Evaluate the real estate characteristics of the Passaic River watershed area to support WRDA candidate restoration site decision making. 28K. Determine consistency with NRDA requirements. 28L. Other NEPA-EIS data needs.
	Identify and evaluate the feasibility of other WRDA projects in the Study Area.	29. Is there a quantifiable/defensible benefit to conducting additional sediment remediation (beyond what is required under CERCLA) through a WRDA contribution to the remedial effort?	29A. The results of the comparative evaluation of remedial alternatives from Tasks 21-26. 29B. Ecological risk assessments for potential WRDA expanded remediation scenarios. 29C. Economic analysis of the proposed project.
		30. To what extent are Passaic River remedial actions warranted/feasible to reduce the export of contamination to other areas in the Hudson Raritan Estuary, even if recontamination of the Passaic River sediments may be experienced due to uncontrolled upstream sources? Decision Rule: The implementation cost for a remedial alternative to improve dredged material management for the navigational dredging program will be evaluated via an economic analysis.	30A. Results of evaluation in Task 24. 30B. Model output to predict fate and transport of contaminants from external loads following Study Area sediment remediation, transport to Newark Bay, and durations associated with recontamination of the Study Area. 30C. Economic analysis of avoided navigational dredging and disposal costs in Newark Bay maintenance and deepening projects.

Attachment 1.2

Data Needs/ Data Use

Data Needs/Data Uses Table

Data Need	Data User	Program	Medium	Parameter	Methodology/ Protocols	RLs	Notes (e.g., sample quantity, distribution)	Data Use
Radionuclide activities and contaminant concentrations in finely segmented sediment cores	Geochemist, Modeler	High Resolution Coring Program	Sediment	a) Be-7, Cs-137, Pb-210 and Th-234	QAPP Table 4-4	QAPP Attachment 3.2	The 2005 High Resolution Coring Program includes 8 high resolution cores (refer to FSP Figures 3-1 through 3-18 for preliminary locations). The cores will be initially segmented into 12 cm slices (finer segmentation may be conducted in the near-surface sediments), yielding an anticipated 546 samples for initial radionuclide dating. Following review of the radionuclide profiles, selected segments will be submitted for chemical analysis.	Depositional chronology for contaminants; update of Conceptual Site Model; investigation of historic sources and loads.
				b) PCB Congeners	Method 1668A	QAPP Table 2-7		
				c) Dioxins/furans	Method 1613B	QAPP Table 2-6		
				d) DDT and metabolites	GC-MS-SIM (CLP SOM1.0)	QAPP Table 2-4		
				e) TCL Semivolatile Organics		QAPP Table 2-3		
				f) TAL Metals	CLP ILM0.5.3	QAPP Table 2-1		
				g) Total Organic Carbon	Lloyd Kahn	QAPP Attachment 3.1		
				h) Grain Size	ASTM D422	QAPP Attachment 3.2		
				i) Bulk Density	Processing Facility Measurement			
Sediment contaminant concentrations and geotechnical properties	Remedial Engineer, Modeler, Risk Assessor	Low Resolution Coring Program	Sediment	a) PCB Screening	Method 4025	QAPP Attachment 3.1	The 2005 Low Resolution Coring Program will consist of 15 cores in the Lower 6 miles of the Study Area (each co-located with a historic data point) and 36 cores in the Upper 11 miles, for a total of 51 cores (refer to FSP Figures 3-1 through 3-18). The cores will be generally segmented into 2-foot intervals, although the segmentation scheme for every 3rd core will include 0-2 cm, 2-5 cm, 5-10 cm, and 10-30 cm near-surface aliquots for sediment transport modeling. Chemical analyses of the low resolution sediment samples will consist initially of screening analyses of approximately 150 segments, followed by full laboratory analysis of approximately 10% of the screening samples. Approximately 600 additional low resolution cores will be added in 2006 based on geostatistical analyses and data gap evaluations.	Contaminant spatial extent (distribution and concentration in sediments); mixing zone depth; sediment transport modeling; sediment material handling properties with respect to remedial alternative evaluation; ecological risk assessment.
				b) Dioxin Screening	Method 4025			
				c) Metals Screening	XRF Method 6200			
				d) Be-7, Cs-137, Pb-210, and Th-234	QAPP Table 4-4	QAPP Attachment 3.2		
				e) PCB Congeners	Method 1668A	QAPP Table 2-7		
				f) Dioxins/furans	Method 1613B	QAPP Table 2-6		
				g) PCB Aroclors	GC-MS-SIM (CLP SOM1.0)	QAPP Table 2-5		
				h) TCL Volatile Organics		QAPP Table 2-2		
				i) TCL Semivolatile Organics		QAPP Table 2-3		
				j) TCL Pesticides		QAPP Table 2-4		
				k) TAL Metals	CLP ILM0.5.3	QAPP Table 2-1		
				l) Chlorinated Herbicides	Method 8151A	QAPP Attachment 3.1		
				m) Methyl-mercury	Method 1630			
				n) Arsenic speciation	Method 1632A			
				o) Hexavalent Chromium	Method 7199/3060A			
				p) Acid Volatile Sulfide	Method 821-R-91-100			
				q) SEM Metals	SW-846			
				r) Kjeldahl Nitrogen	Method 351.3			
				s) Total Organic Carbon	Lloyd Kahn			
				t) Butyltins	Lab-prepared SOP			
				u) Cation Exchange Capacity	Method 9081	QAPP Attachment 3.2		
				v) Grain Size	ASTM D422			
				w) Percent Moisture	ASTM D2974			
				x) Atterberg Limits	ASTM D4318			
				y) Specific Gravity	ASTM D894			
				z) pH	Method 9045C			
				aa) Bulk Density	Processing Facility Measurement			

Data Needs/Data Uses Table

Data Need	Data User	Program	Medium	Parameter	Methodology/ Protocols	RLs	Notes (e.g., sample quantity, distribution)	Data Use
Contaminant concentrations in mudflat sediments	Remedial Engineer, Risk Assessor, Modeler	Mudflat Coring Program	Sediment	a) 5-10 cm "core tops" will be analyzed for all parameters listed in the Low Resolution Coring Program.	a) and b) Refer to information provided for Low Resolution Coring Program and QAPP Tables 4-1 through 4-5.	a) and b) Refer to information provided for Low Resolution Coring Program, QAPP Tables 2-1 through 2-7, and QAPP Attachments 3.1 and 3.2.	The mudflat sediment cores will be collected from approximately 52 locations as shown on FSP Figures 3-1 through 3-18. At each location, a core will be advanced to 3-4 feet or refusal, whichever is encountered first. A 5-10 cm core top from each core will be analyzed for all parameters listed in the Low Resolution Coring Program. The remainder of each core will be segmented and analyzed in the same fashion as the low resolution core samples, yielding an additional 100 samples for screening analysis (approximately 10% will be submitted for full lab analyses).	Contaminant spatial extent; human and ecological risk assessment.
				b) 2-foot segments in the remainder of the core will be analyzed in the same fashion as the low resolution cores.				
Sediment erosion rate as a function of depth, bulk density, organic carbon, etc.	Sediment Transport Modeler, Remedial Engineer	Hydrodynamic/ Sediment Transport Work Plan	Sediment	Erosion rate as a function of shear stress	USACE WES Sedflume Testing		15 to 30 box core samples to be collected from locations throughout the Study Area and subsampled for the various analyses; selection of locations will be guided by hydrodynamic simulations, geophysical surveys, and sediment characterization studies.	Provides in situ sediment erosion and transport properties with depth below the sediment/water interface; necessary to assess resistance of bottom sediment to scour and transport; evaluation of potential remedial alternatives.
				Bulk Density Profile	Gotthard Density Profiler			
				Particle Size Distribution (PSD)	Malverne Mastersizer			
				TOC	Lloyd Kahn	QAPP Attachment 3.1		
				Percent Moisture	ASTM D2974	QAPP Attachment 3.2		
				Pb-210	QAPP Table 4-4			
Sediment erosion rate as a function of depth, bulk density, organic carbon, etc., at very low shear stresses	Sediment Transport Modeler, Remedial Engineer	Hydrodynamic/ Sediment Transport Work Plan	Sediment	Critical shear and erodibility	Gust Microcosm Testing		Box core samples to be collected at a subset of Sedflume locations and subsampled for various analyses.	Provides estimate of surface sediment transport properties with depth below the sediment/water interface; necessary to assess resistance of bottom sediment to scour and transport; evaluation of potential remedial alternatives.
				Bulk Density Profile	Gotthard Density Profiler			
				Particle Size Distribution (PSD)	Malverne Mastersizer			
				TOC	Lloyd Kahn	QAPP Attachment 3.1		
				Specific Gravity	ASTM D854	QAPP Attachment 3.2		
				Percent Moisture	ASTM D2974			
				Pb-210	QAPP Table 4-4			
Methylation Rates	Mercury Fate Modeler	Hydrodynamic/ Sediment Transport Work Plan	Sediment	Methyl Mercury	Analysis to be performed following protocols in Heyes, et al, Marine Chemistry Vol. 90 (2004), pp. 75-89.		To be performed by Bob Mason on selected (3-5) sediment cores	Critical to understanding the fate of the most toxic fraction of mercury in the water column.
Porewater contaminant concentrations	Geochemist, Modeler, Risk Assessor	Porewater Sampling Program	Porewater	a) Chloride	To be provided in QAPP amendment for 2006 sampling effort.	To be provided in QAPP amendment for 2006 sampling effort.	Approximately 20 porewater sampling locations will be selected for the 2006 field sampling season. The locations will be selected based on aqueous and sediment data obtained from the 2005 sampling season. Porewater samples will be co located with low resolution core samples.	Characterize tendency of chemicals to diffuse from porewater into the water column (as opposed to desorption from sediments); development of partitioning coefficients.
				b) Inorganics (TBD)				
				c) Other water quality parameters (TBD)				

Data Needs/Data Uses Table

Data Need	Data User	Program	Medium	Parameter	Methodology/ Protocols	RLs	Notes (e.g., sample quantity, distribution)	Data Use
Contaminant concentrations in the water column; evaluate eutrophication component	Geochemist, Modeler, Risk Assessor	Fixed Transect Sampling Program	Surface water	a) BOD	Method 405.1	QAPP Attachment 3.2	Fixed water column sampling transects will be established at 6 locations in the Passaic River (refer to FSP Figures 3-1 through 3-18). Samples will be collected to separately represent (where applicable) the freshwater and saline depth intervals in the water column and will also be depth-integrated samples. Samples will be composites representing two 6-hour tidal cycles (e.g., both diurnal occurrences of ebb tide) at each transect. Approximately 192 samples (both filtered and unfiltered) will be collected during the program. Up to 4-8 spatial surveys will be conducted for the eutrophication components (chlorophyll a, nutrients, and light transparency), conducted coincident with the regular fixed transect sampling. A rising/falling tide water column sampling program will be developed with additional sampling locations, as needed, based on the fixed transect results. Note: An additional 20-25 monitoring locations will be located throughout the modeling domain (e.g., Hackensack River, the Kills, Berry's Creek) and will be sampled coincidentally with the Passaic River transects. This scope will be addressed as part of the Newark Bay Remedial Investigation Work Plan and Modeling Plan.	Assess COPC/COPEC concentrations and transport variation in a given volume of water (as it moves with the tide) for fate and transport modeling; calibrate eutrophication component of model; human and ecological risk assessment. Since the fate and transport model is carbon-based, the calibration of the eutrophication model affects the fate of the chemicals sorbing into the organic fraction.
				b) COD	Method 410.3			
				c) DOC	Method 9060	QAPP Attachment 3.1		
				d) POC	Method 440.0			
				e) TOC	Method 9060			
				f) TDS	Method 160.1	QAPP Attachment 3.2		
				g) TSS	Method 160.2			
				h) VSS	Method 160.4			
				i) TCL Volatile Organics	GC-MS-SIM (CLP SOM1.0)	QAPP Table 2-2		
				j) TCL Semivolatile Organics		QAPP Table 2-3		
				k) TCL Pesticides		QAPP Table 2-4		
				l) TAL Metals	CLP ILM0.5.3	QAPP Table 2-1		
				m) Chlorinated Herbicides	Method 8151A	QAPP Attachment 3.1		
				n) Methyl-mercury	Method 1630			
				o) Hexavalent Chromium	Method 7199/3060A			
				p) Kjeldahl Nitrogen	Method 351.3			
				q) Be-7, Cs-137, Pb-210	QAPP Table 4-4	QAPP Attachment 3.2		
				r) PCB Congeners	Method 1668A	QAPP Table 2-7		
				s) Dioxins/furans	Method 1613B	QAPP Table 2-6		
				t) Chlorophyll a	Method 445.0	QAPP Attachment 3.2		
				u) Radon	SM 7500-Rn B			
				v) pH	Method 9045C			
				w) Total and ortho-phosphate	Method 365.2			
				x) Methane	EPA Region I NATATTEN Rev 1	QAPP Attachment 3.1		
				y) Dissolved Oxygen	Field Measurement			
				z) Conductivity	Field Measurement			
				aa) Sulfides	Method 9030B/9034	QAPP Attachment 3.1		
				bb) Ammonia	Method 350.1			
Water column contaminant loads from tributaries	Geochemist, Modeler, Risk Assessor	Tributary Sampling Program	Surface water	Refer to parameter list for Fixed Transect Sampling Program above.			Water column sampling transects will be established at three to four locations in the tributaries to the Passaic River (Saddle River, Second River, and Third River). The inclusion of the Hackensack River will be assessed based on magnitude of flow over the Oradell Dam. The water column sampling transects will be located in the farthest downstream point of freshwater flow in each tributary. Samples will be collected as depth-integrated composite samples. Approximately 96 samples will be collected during the program. Sampling locations are shown on FSP Figures 3-1 through 3-18.	Water column contaminant mass balance and estimation of contaminant loads to Passaic River for evaluation of COPC/COPEC fate and transport; human and ecological risk assessment.

Data Needs/Data Uses Table

Data Need	Data User	Program	Medium	Parameter	Methodology/ Protocols	RLs	Notes (e.g., sample quantity, distribution)	Data Use
Contaminant concentrations in candidate restoration site environmental media; candidate site soil/sediment geotechnical properties.	Remedial Engineer, Restoration Designer	Candidate Restoration Site Investigations	Soil, Sediment, Surface Water, Storm Water, and Groundwater	a) TCL Volatile Organics	GC-MS-SIM (CLP SOM1.0)	QAPP Table 2-2	Environmental and geotechnical investigations of candidate restoration sites will be conducted according to the field procedures presented in FSP Volume 3.	Prioritization of candidate sites for WRDA restoration; restoration design.
				b) TCL Semivolatile Organics		QAPP Table 2-3		
				c) TCL Pesticides		QAPP Table 2-4		
				d) TAL Metals	CLP ILM0.5.3	QAPP Table 2-1		
				e) PCB Congeners	Method 1668A	QAPP Table 2-7		
				f) Dioxins/furans	Method 1613B	QAPP Table 2-6		
				g) Total Organic Carbon	Lloyd Kahn	QAPP Attachment 3.1		
				h) Grain Size	ASTM D422	QAPP Attachment 3.2		
				i) Percent Moisture	ASTM D2974			
				j) Atterberg Limits	ASTM D4318			
Continuous TSS load passing over Dundee Dam	Sediment Transport Modeler	USGS Monitoring Program via IAG with USEPA	Surface water	TSS	as per USGS program		Continuous one-year monitoring program using automated sampler; to be implemented by USGS.	Estimation of solids load delivered over Dundee Dam is necessary to evaluate depositional/erosional character of river and long term fate of COPCs/COPECs in the Passaic River Sediment.
Passaic River Particle Size Distribution (PSD) during various flow conditions	Sediment Transport Modeler	Hydrodynamic/ Sediment Transport Work Plan	Surface water	TSS	Method 160.2	QAPP Attachment 3.2	Samples will be collected during 12 shipboard CTD surveys under various flow conditions.	Estimation of grain size distribution of suspended particles is necessary since distribution affects depositional/erosional character of river and long term fate of COPCs/COPECs in the Passaic River Sediment.
				Grain Size	ASTM D422			
Sediment Particle Settling and Flocculation Characteristics during various flow conditions	Sediment Transport Modeler	Hydrodynamic/ Sediment Transport Work Plan	Surface water	TSS, PSD, dis-aggregated PSD, and current velocity	Video settling tubes, Valeport or Owens tubes, LISST, OBS, ADCP, Malverne Mastersizer		Video settling tube, LISST, OBS, and Valeport tube to measure particle settling velocities and flocculation characteristics. To be conducted by University of Maryland during Hydrodynamic/Sediment Transport studies. Test will be conducted during various flow conditions (low and high flows).	Estimation of grain size distribution of suspended particles is necessary since distribution affects depositional/erosional character of river and long term fate of COPCs/COPECs in the Passaic River Sediment. Also necessary to assess depositional properties of particles.
Vertical TSS and VSS Distribution in Water Column	Sediment Transport Modeler	Hydrodynamic/ Sediment Transport Work Plan	Surface water	TSS	Method 160.2	QAPP Attachment 3.2	Grab samples from various depth intervals in the water column (e.g., at 1-foot intervals), collected at the mooring locations by Rutgers and MPI.	Estimation of grain size distribution of suspended particles is necessary to evaluate depositional/erosional character of river and long term fate of COPCs/COPECs in the Passaic River Sediment.
				VSS	Method 160.4			
Vertical Salinity and Temperature Distribution in Water Column	Modeler	Rutgers/PVSC/MERI and Hydrodynamic/ Sediment Transport Work Plan	Surface water	Vertical profiles of salinity and temperature	Obtain data from Rutgers/PVSC/MERI and via MPI Shipboard CTD Surveys and mooring data collection		In addition to ongoing Rutgers/PVSC/MERI programs and Hydrodynamic Work Plan efforts, will require salinity and temperature measurements with depth at different times of tidal cycle in the Passaic/ Hackensack/Newark Bay and the Kills; will coordinate with on-going programs	Calibration of model density computations; model validation.
Contaminant Loads from CSOs and POTWs	Fate and Transport Modeler	PRP-implemented sampling program	Surface water	COPC/COPEC	Sample analytical methods and RLs expected to conform with RI/FS QAPP; to be finalized via PRP program development.		Minimum data needs consist of composite samples collected from CSOs during 4-6 events. For POTW outfalls, minimum data needs consist of daily composites collected 4-6 times/year. Sampling program to be conducted by PRPs.	Estimation of contaminant loads from CSOs and POTWs is necessary to evaluate fate and transport of COPCs/COPECs in the Passaic River sediments.

Data Needs/Data Uses Table

Data Need	Data User	Program	Medium	Parameter	Methodology/ Protocols	RLs	Notes (e.g., sample quantity, distribution)	Data Use
Meteorological Data	Modeler	NOAA/NCDC (Regional Airports)	Atmospheric/Study Area physical characteristics	Wind, solar radiation, air temperature, relative humidity, pressure	Obtain hourly data recording from NOAA/NCDC		Meteorological data to be obtained for Study Area.	Computation of air/sea heat exchange (water temperature) for model calibration/validation.
Aerial Photography of Study Area	Modeler	Aerial Survey	Study Area physical characteristics	Wetland boundary	Refer to FSP Volume 3		High-resolution aerial photographs needed to delineate the wetland boundary in the Meadowlands.	Model configuration/extent and calibration/validation.
Elevation of river bottom in Passaic River, Hackensack River, etc.	Modeler	Bathymetric Survey	Study Area physical characteristics	Bathymetry	USACE 2004 Survey (refer to FSP Volume 3) and other surveys to be accomplished under Newark Bay project.		Bathymetric data needed for the Passaic River, Hackensack River, and Meadowlands wetland areas.	Model configuration and calibration/validation.
Upstream Inflows to River	Modeler	USGS Data Collection	Study Area physical characteristics	Inflow volume	Obtain daily data recording from USGS		Estimate flow at Dundee Dam (based on the USGS gauge data at Little Falls) and Oradell Dam	Water velocity and density (salinity) computation; evaluation of inflow with respect to depositional/erosional character of river; model calibration/validation.
Freshwater inflows (from CSO, POTW, etc.)	Modeler	Literature Search	Study Area physical characteristics	Inflow volume	Obtain daily POTW inflows from NPDES records; obtain CSO/SW estimates from HEP pathogen TMDL modeling efforts		Estimate inflows from outfalls within the study domain	Water velocity and density (salinity) computation; evaluation of inflow with respect to depositional/erosional character of river; model calibration/validation.
Currents/velocity	Modeler	Rutgers Data Collection	Study Area physical characteristics	Water velocity	Obtain current velocity data from Rutgers		May recommend additional measurements after review of Rutgers data.	Water velocity necessary for model calibration/validation.
Water Levels	Modeler	NOAA Data Collection	Study Area physical characteristics	Water surface elevation	Obtain hourly water elevation data from NOAA		In addition to NOAA's Bergen Point station (off Newark Bay) data, additional water level data at various locations in the Passaic and Hackensack Rivers may be required.	Calibration of sea surface level computations (volume exchange); model calibration/validation.

Attachment 2

Compilation of Human Health and Ecological Risk-Based Action Levels

Compilation of Human Health and Ecological Risk-Based Action Levels

	Action Levels - ECOLOGICAL													Action Levels - HUMAN HEALTH				
	Water Quality (marine)			Benthic Organisms (marine sediment)								Fish (marine when available)			Water		Soil		Tissue
Chemical	NRWQC - CCC [a]	NYSDEC[b]	NJDEP[c]	ER-L[d]	ER-M[d]	TEL[e]	PEL[e]	Washington State[f]	Canada[g]	EPA EqP Method[h]	AET Method[i]	No Effect Concentration (ERED)[j]	Species	Endpoint	NRWQC - fish consumption[k]	NJDEP[c]	EPA Region 9 HH Soil PRG[l]	NJDEP Soil PRG (residential)	EPA Region 3 Tissue RBCs[m]
METALS (mg/L water or mg/kg sediment, tissue)																			
Antimony	500 (NOAA, 1999)			2	25										640	4,300	31	31	0.5
Arsenic (total)	36			8.2	70	7.2	41.6	57				0.53	Bluegill	Reproduction	0.1	0	0.39	0.4	0.002
Arsenic (III)	36																		
Arsenic (V)	13 (OR, 1996)																		
Barium											48					2,000	5,400	5,500	95
Beryllium											0.36	5.13	Bluegill	Mortality			150	16	2.7
Cadmium	8.8			1	10	0.7	4.2	5.1				1	Winter Flounder	Biochemical		10	37	39	0.7
Chromium (total)	50			81	370	52.3	160.4	260				0.54	Rainbow trout	Biochemical		3,230	30		4.1
Chromium (VI)	50	54																	4.1
Cobalt																	900	1,600	27
Copper	3.1	3.4	7.9	34	270	18.7	108.2	390				<1.5	Striped mullet (juvenile)	Toxicity		5.6	3,100	3,100	54
Lead	8.1	8	210	47	218	30.2	112.2	450				0.451	Fathead Minnow	Biochemical		24	400	400	NA
Manganese											480				100	100	1,800	1,600	27
Mercury (total)	0.9			0.15	0.71	0.1	0.7	0.4				0.09	Spiny Dogfish	Behavior		0.146	23	23	
Methylmercury												0.02	Mummichog		0.3 mg/kg		6		0.1
Nickel	8.2	8.2		21	52	15.9	42.8					2.2	Rainbow trout	Biochemical	4,600	3,900	1,600	1,600	27
Selenium	71										1	0.2	Chinook salmon	Growth	4,200	10	390	390	6.8
Silver	1	2.3		1	4	0.7	1.8	6.1				0.044	Bluegill	Growth		164	390	390	6.8
Thallium												2.7	Bluegill	Mortality	6.3	6.22	5	16,000	0.095
Titanium																	1.0E+05		5,400
Vanadium												0.7	American flagfish	Growth			78	550	1.4
Zinc	81	66		150	410	124	271	410				12	Atlantic Salmon	Growth	26,000		23,000	23,000	410
VOCs (mg/L water or mg/kg sediment, tissue)																			
1,2-Dichloroethylene	224,000 (OR and NH, 1996)															592	69,000	43,000	
1,4-Dichlorobenzene		5						3,100		340	35	52,000	Rainbow trout	Development	2,600	3,159	3,400	610,000	130
1,2,4-Trichlorobenzene	5.4 (Canada, 1999)							810			31	50	Spot	Behavior	940	113	62,000	73,000	14,000
Benzene		190								57		1,400	Pacific Herring	Reproduction	51	71	640	3,000	57
Chlorobenzene		5								820		3,000	Rainbow trout	Physiological	21,000	21,000	150,000	510,000	27,000
Ethylbenzene		4.5								1,400	10				29,000	27,900	400,000	7.8E+06	140,000
Methyl chloride	6,400 (NH, 1996)																9,100		
SVOCs (mg/L water or mg/kg sediment, tissue)																			
Bis(2-Ethylhexyl)phthalate	3.4 (NH, 1996)					182.2	2,646.5	47,000			1,300				2.2	5.92	35,000	35,000	230
Biphenyl										1,100	260						3.0E+06	3.1E+06	68,000
Butylbenzylphthalate	3.4 (NH, 1996)							4,900		11,000	63	6,450	Bluegill	Mortality	1,900	416	1.2E+07	1.2E+06	270,000
Carbazole											970	580	Rainbow trout	Behavior			24,000	24,000	160
Di-n-Octyl phthalate								58,000			25						2.4E+06	1.2E+06	54,000
N-nitroso-di-phenylamine								11,000			28	2,000	Bluegill	Mortality		16.2	99,000	99,000	640
BUTYLTINS (mg/L water or mg/kg sediment, tissue)																			
Monobutyltin												300	Rainbow trout	Cellular					
Dibutyltin												500	Rainbow trout	Cellular					
Tributyltin	0.01				25							2500	Rainbow trout	Cellular			18,000		410
PAHs (mg/L water or mg/kg sediment, tissue)																			
1-Methylphenanthrene											310								
2,3,5-Trimethylnaphthalene											54								
2,6-Dimethylnaphthalene											33								
2-Methylnaphthalene		4.2		70	670	20.2	201				670								5,400
Acenaphthene		6.6		16	500	6.7	88.9			1,300	500	3,500	Bluegill	Mortality	990		3.7E+06	3.4E+06	81,000
Acenaphthylene				44	640	5.9	127.9				560								
Anthracene				85	1,100	46.9	245				960				40,000	108,000	2.2E+07	1.7E+07	410,000
Fluorene				19	540	21.2	144.4	23,000		540	540	1,800	Rainbow trout	Behavior	5300	1340	2.7E+06	2.3E+06	54,000
Naphthalene		16		160	2,100	34.6	390.6			470	2,100	2,300	Mummichog	Biochemical			56,000	2,400,000	27,000
Phenanthrene		1.5		240	1,500	86.7	543.5			1,800	1,500	30,000	Rainbow trout	Biochemical					
LMW PAHs				552	3,160	311.7	1,442				5,200								
Benzo[a]pyrene	0.01 (BC, 1998)			430	1,600	88.8	763.2	99,000	500		1,600	14	Yellowspotted rockcod	Growth	0.02	0.031	62	60	0.43
Benzo[b]fluoranthene											3,200				0.02	0.031	620	600	4.3
Benzo[e]pyrene																			
Benzo[g,h,i]perylene	300 (NH, 1996)							31,000	100		670	27,500	Common carp	Biochemical					
Benzo[k]fluoranthene	300 (NH, 1996)										4,300				0.02	0.031	6,200	6,000	43

Compilation of Human Health and Ecological Risk-Based Action Levels

	Action Levels - ECOLOGICAL													Action Levels - HUMAN HEALTH				
	Water Quality (marine)			Benthic Organisms (marine sediment)								Fish (marine when available)			Water		Soil		Tissue
Chemical	**NRWQC - CCC [a]**	**NYSDEC[b]**	**NJDEP[c]**	**ER-L[d]**	**ER-M[d]**	**TEL[e]**	**PEL[e]**	**Washington State[f]**	**Canada[g]**	**EPA EqP Method[h]**	**AET Method[i]**	**No Effect Concentration (ERED)[j]**	**Species**	**Endpoint**	**NRWQC - fish consumption[k]**	**NJDEP[c]**	**EPA Region 9 HH Soil PRG[l]**	**NJDEP Soil PRG (residential)**	**EPA Region 3 Tissue RBCs[m]**
Chrysene	300 (NH, 1996)			384	2,800	107.8	846				1,400	13,200	Brown bullhead	Lesions/tumor	0.02	0.031	62,000	62,000	430
Dibenz[a,h]anthracene				63	260	6.2	134.6	12,000			230				0.02	0.031	62	60	0.43
Fluoranthene	16 (OR and NH, 1996)			600	5,100	112.8	1,493.5	160,000		6,200	2,500	1250	Rainbow trout	Biochemical	140	393	2.3E+06	2.3E+06	54,000
Indeno[1,2,3-c,d]-pyrene	300 (NH, 1996)							34,000			37,000				0.02	0.031	620	600	4.3
Perylene																			
Pyrene	300 (NH, 1996)			665	2,600	153	1,398	1,000				30,000	Rainbow trout	Biochemical	4,000	8,970	2.3E+06	1.7E+06	41,000
High Molecular Weight PAHs				1,700	9,600	655.3	6,676.1												
PAHs, Total				4,022	44,792	1,684	16,770												
Dibenzothiophene												3,000	Rainbow trout	Behavior					
PCBs - Aroclors (mg/L water or mg/kg sediment, tissue)																			
Aroclor 1016	0.03								100										45
Aroclor 1221	0.03																		1.6
Aroclor 1232	0.03																		1.6
Aroclor 1242	0.03											232	Channel catfish	Morphology					1.6
Aroclor 1248	0.03								50										1.6
Aroclor 1254	0.03								63	418		160	Chinook salmon	Growth					1.6
Aroclor 1260	0.03								5			7.6E+06	Fathead Minnow	Reproduction					1.6
PCBs - Congeners (pg/L water or ng/kg sediment, tissue)[op]																			
PCB 77	40 (BC, 1998)											940,000	Arctic grayling	Biochemical					
PCB 81																			
PCB 105	90 (BC, 1998)																		
PCB 114																			
PCB 118												2.44E+07	Common Carp	Biochemical					
PCB 123																			
PCB 126	0.25 (BC, 1998)											18,000	Common Carp	Biochemical					
PCB 156																			
PCB 157																			
PCB 167																			
PCB 169	60 (BC, 1998)																		
PCB 189																			
PCB 18																			
PCB 28																			
PCB 44																			
PCB 49																			
PCB 52												1.10E+09	Fathead minnow	Reproduction					
PCB 66																			
PCB 101																			
PCB 110																			
PCB 87																			
PCB 128																			
PCB 138																			
PCB 153																			
PCB 170																			
PCB 180												1.21E+09	Fathead minnow	Reproduction					
PCB 183																			
PCB 187																			
PCB 195																			
PCB 206																			
PCB 209																			
Total PCBs	30,000			22,700	180,000	22,000	189,000				1.0E+06	18,100	Dab	Biochemical	64,000	170,000	2.10E+07	200,000	1,600
PESTICIDES (mg/L water or mg/kg sediment, tissue)																			
2,4'-DDD											16								
2,4'-DDE											15								
2,4'-DDT											3.9								
4,4'-DDD				2.0	20	1.2	7.8				16	5,000	Brook trout	Growth	0.00031	0.000837	2,400	3,000	13
4,4'-DDE				2.2	27	2.1	374.2				15	2,400	Lake trout	Behavior	0.00022	0.000591	1,700	2,000	9.3
4,4'-DDT	0.001		0.13	1	7	1.2	4.8				3.9	31	Atlantic Salmon	Reproduction	0.00022	0.0006	1,700	2,000	9.3
Total DDXs (sum of the six 4,4'- and 2,4'-isomers)				1.58	46.1	3.9	51.7		6.0	1.5	3.0	43,000	Sailfin molly	Physiological					
Aldrin	1.3		1.3								0.44	5,000	Atlantic Salmon	Growth	0	0	29	40	0.19
BHC (gamma) Lindane	0.16		0.16			0.32	0.99			3.70		297	Bluegill	Growth	0.019		440	400	2.4
BHC (alpha)												30	Guppy	Physiological	0.0026	0.013	90	100	0.5
BHC (beta)															0.0091	0.46	320	400	1.8
Chlordane	0.004		0.09	0.5	6										0.00081	0.00030	1,600	200	9

Compilation of Human Health and Ecological Risk-Based Action Levels

	Action Levels - ECOLOGICAL													Action Levels - HUMAN HEALTH				
	Water Quality (marine)			Benthic Organisms (marine sediment)								Fish (marine when available)			Water		Soil		Tissue
Chemical	**NRWQC - CCC [a]**	**NYSDEC[b]**	**NJDEP[c]**	**ER-L[d]**	**ER-M[d]**	**TEL[e]**	**PEL[e]**	**Washington State[f]**	**Canada[g]**	**EPA EqP Method[h]**	**AET Method[i]**	**No Effect Concentration (ERED)[j]**	**Species**	**Endpoint**	**NRWQC - fish consumption[k]**	**NJDEP[c]**	**EPA Region 9 HH Soil PRG[l]**	**NJDEP Soil PRG (residential)**	**EPA Region 3 Tissue RBCs[m]**
Dieldrin	0.002		0.710	0.02	8	0.7	4.3					1,200	European plaice	Biochemical	0.000054	0.00014	30	40	0.2
Endosulfan (I and II)	0.009	0.001	0.034							5.4		20,000	Australian freshwate	Cellular	89	0.0087	370,000	470,000	8,100
Endrin	0.002		0.037	0.02	45					2.15		0	Rainbow Trout	Physiological	0.81	0.0023	18,000	23,000	410
Heptachlor	0.004		0.053							1.04		4,800	Sheepshead minnow	Cellular	0.000079	0.00020	110	100	0.7
Heptachlor epoxide	0.004		0.053						1			4,800	Sheepshead minnow	Cellular	0.000039	0.00011	53	70	0.35
Methoxychlor	0.03	0.03							6 (NYDEC, 1994)	19		1,400	Brook trout	Behavior		0.03	3.1E+05	390,000	6,800
Toxaphene	0.0002	0.005	0.21						0.1 (NYDEC, 1994)	100		250	Mosquito fish	Physiological	0.0003	0.0002	440	600	2.9
2,4,5-T																	6,100		14,000
2,4,5-TP																	490,000		11,000
2,4-D												1,000	Spiny Dogfish	Mortality			690,000		14,000
2,4-DB																	490,000		11,000
DIOXINS/FURANS (pg/L water or ng/kg sediment, tissue)																			
2,3,7,8-TCDD									100 (NYSDEC, 1989)			125	Coho salmon	Growth	0.0051	0.000014	39		0.021
1,2,3,7,8-PeCDD												63,800	Common carp	Biochemical					
1,2,3,4,7,8-HxCDD												39	Rainbow Trout	Biochemical					
1,2,3,6,7,8-HxCDD																			
1,2,3,7,8,9-HxCDD																			
1,2,3,4,6,7,8-HPCDD																			
OCDD																			
2,3,7,8-TCDF												2,500	Rainbow trout	Growth					
1,2,3,7,8-PECDF												129,000	Common carp	Biochemical					
2,3,4,7,8-PECDF																			
1,2,3,4,7,8-HXCDF												990	Rainbow Trout	Mortality					
1,2,3,6,7,8-HXCDF																			
2,3,4,6,7,8-HXCDF																			
1,2,3,7,8,9-HXCDF																			
1,2,3,4,6,7,8-HPCDF																			
1,2,3,4,7,8,9-HPCDF																			
OCDF												10,000	Atlantic salmon	Mortality					
WATER QUALITY PARAMETERS																			
Cyanide	1	1	1												220,000	1	11		27

a Except where noted, values are from the National Recommended Water Quality Criteria for Priority Toxic Pollutants and Nonpriority Pollutants (NRWQC) for seawater; CCC (Criterion Continuous Concentration) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely witho
NOAA (National Oceanic and Atmospheric Administration) Screening Quick Reference Table for Inorganics in Water. Proposed Value. September 1999.
OR = Oregon Department of Environmental Quality. 1996. State-wide water quality management plan: beneficial uses, policies, standards, and treatment criteria for Oregon. 178 pp.
NH = New Hampshire Department of Environmental Services. 1996. State of New Hampshire surface water quality regulations. Env-WS 430. 37 pp.
Canada, 1999 = Environment Canada, 1999. Canadian water quality guidelines
BC = British Columbia Ministry of Environment, Lands, and Parks. 1998. British Columbia approved water quality guidelines (Criteria): 1998 Edition. ISBN 0-7726-3680-X. 30 pp.

b New York State Department of Environmental Conservation. 1998. Ambient water quality standards and guidance values and groundwater effluent limitations. 124 pp.

c New Jersey Department of Environmental Protection Surface Water Quality Standards for human and aquatic endpoints NJAC 7:9B-1.14(c)13. Available online at: http://www.state.nj.us/dep/wmm/sgwqt/2004swqs.pdf

d Effects Range - Low (ER-L) and Effects Range Medium (ER-M): Long and Morgan. 1991. The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program, NOAA Technical Memorandum NOS OMA 52.
Long et al., 1995. Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments, *Environmental Management* 19(1): 81-97.

e Threshold Effects Level (TEL) and Probable Effects Level (PEL) from MacDonald et al., 1996. Development and evaluation of sediment quality guidelines for Florida coastal waters. *Environ manage* 19:81-97.

f Washington State Sediment Quality Chemical Criteria WAC 172-204-320

g Miisstere de l'Environment du Quebec et Environnement Canada. 1992. Interim criteria for quality assessment of St. Lawrence River sediment ISBN 0-662-19849-2. St. Lawrence Action Plan.

h Equilibrium Partitioning Method. EPAThe incidence and severity of sediment contamination in surface waters of the US. Volume 1: National sediment quality survey. USEPA 823-R-97-006. Office of Science and Technology.

i Apparent Effects Threshold Method. Barrick et al. 1988. Sediment quality values refinement. Volume I and II. 1988 Update and evaluation of Puget Sound AET and Becker et al. 1990. Evaluation of the AET approach for assessing contamination of marine sediments in CA: Report No. 90-3 WQ. California State Water Quality Board. Sacramento.

j No observed effect concentration (NOEC) values from ERED (Environmental Residue-Effects Database), available at: http://el.erdc.usace.army.mil/ered/

k Values from NRWQC for the protection of human health through fish consumption only. Table available at: http://www.epa.gov/waterscience/pc/revcom.pdf

Attachment 3

Attachments 3.1 and 3.2 – Draft Lab Task Orders

ATTACHMENT 3.1 – DRAFT

TASK ORDER NO. 1

[X] ORIGINAL

[_____] AMENDMENT [Date of Original_____]

Subject to the Subcontract between *Malcolm Pirnie, Inc.* [**Malcolm Pirnie**] and _____. [**Laboratory**], dated _____, 2005, Malcolm Pirnie hereby authorizes Laboratory to perform services as specified in this Task Order and in accordance with the above mentioned Subcontract.

1.0 PROJECT INFORMATION

Project Name:	Lower Passaic River Restoration Project
Client:	US Army Corps of Engineer - Kansas City District
Malcolm Pirnie Project Number:	4553-001
Subcontract Number:	KC-ACE2002-034
Statements of Work:	Chlorinated Herbicides Methyl Mercury Arsenic Speciation Chromium VI Phosphate/Orthophosphate Nitrogen (Kjeldahl) Sulfides Ammonia Methane AVS/SEM Particulate Organic Carbon (POC) Total Organic Carbon (TOC), Dissolved Organic Carbon (DOC) Metals Screening by X-Ray Dioxin Screening (Immunoassay) Dioxins/Furans by HRGC-LRMS Butyl tin Compounds Total Petroleum Hydrocarbons by GC PCB Congeners
Malcolm Pirnie Representative:	James McCann
Malcolm Pirnie Office Address:	17-17 Route 208 North Second Floor Fair Lawn, New Jersey 07410 201-398-4310 direct 201-797-7400 office 201-797-4399 FAX jmccann@pirnie.com
Laboratory Representative:	_____

Laboratory Project No. _____

This Task Order consists of the following Statements of Work (SOWs) for the various analytical services requested from the Laboratory:

2.0 STATEMENT OF WORK – CHLORINATED HERBICIDES

2.1 General description of analytical service requested

Analysis of aqueous and sediment samples for Chlorinated Pesticides.

2.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Sediment/Aqueous	USEPA SW-846 Method 8151A, Chlorinated Herbicides by GC[b] Using Methylation or Pentafluorobenzlation Derivatization plus any additional cleanup required for sediment samples.

[a] It should be noted that the exact number of samples will be field determined and is subject to change.
[b] Gas Chromatography-Electron Capture Detector (GG/ECD) and or Gas Chromatography/Mass Spectrometry (GC/MS)

2.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – Remedial Investigation and Feasibility Study (RI/FS).

2.4 Estimated date(s) of sample collection

May 2005 – December 2007.

2.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

2.6 Holding time and number of days to analysis

Samples and extracts must be stored under refrigeration ($4^{O}C$) and protected from sunlight. Samples must be extracted within 7 days of the date of collection. Extracts must be analyzed within 40 days of the date of extraction.

2.7 Analytical protocol required.

Matrix	Analysis
Sediment/Aqueous	USEPA SW-846 Method 8151A, Chlorinated Herbicides by GC[a] Using Methylation or Pentafluorobenzlation Derivatization plus any additional cleanup required for sediment samples.

[a] Gas Chromatography-Electron Capture Detector (GG/ECD) and or Gas Chromatography/Mass Spectrometry (GC/MS)

2.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.)

The laboratory must adhere to USEPA Method SW-846 8151A protocols for the analytes of interest.

2.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request, and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory).

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a

shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

2.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

2.11 Name of sampling/shipping contact

James McCann
17-17 Route 208 North
Second Floor
Fair Lawn, New Jersey 07410
201-398-4310 (direct)
201-797-7400 (office)
201-797-4399 (fax)
jmccann@pirnie.com

2.12 Data Requirements

The quantification limits are as follows:

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Compounds	**Reporting Limit (RL) Water (µg/L)**	**Reporting Limit (RL) For dry Sediment (µg/kg)**
2,4-D	2	100
2,4-DB	2	100
2,4,5-TP (Silvex)	1	50
2,4,5-T	1	50

Note: Specific quantification limits are highly matrix dependent. The laboratory determined method detection limit (MDL) should be at least a factor of three less than the RLs provided in this table.

2.13 Quality Control Requirements

The following audits are required where applicable:

Audits Required	**Frequency of Audits**	**Limits**
Initial calibration	Prior to analyzing samples.	A five point curve for each compound of interest covering the range of the sample being analyzed and at least down to the RL.
Calibration verification (Using mid-point QC check)	Beginning and end of every 12 hours of samples run	Standards must fall within the absolute retention time windows. Results must be within $\pm$ 15% of the response calculated using the initial calibration.
Method Blanks	Beginning of every 12 hours of the sample run and per batch	<RL
Matrix Spike (MS) and Matrix Spike Duplicate (MSD)	With each batch of up to 20 samples	Percent Recovery (%R) - 40-120%. Relative Percent Difference (RPD) - $\leq$20%

Laboratory Control Sample (LCS)	With each analytical batch of up to 20 samples	%R - 70-130%.
Surrogate Recoveries	With each analysis, before sample extraction, spike each sample and standard with one or two herbicide surrogates.	Use statistically determined QC chart limits. %R - 50-120%
Duplicate Samples	With each batch of up to 20 samples	= 35 % RPD; evaluated for analytes > 5 times MDL.
Field Duplicate	Per batch of 20 samples	= 50 % RPD; evaluated for analytes > 5 times MDL.
Rinsate Blank	Not to exceed one Rinsate per day of sampling, but at least one weekly	< RL

Notes:

A sample batch is composed of a maximum of twenty (20) field samples plus associate QC, which have all been prepared on the same day.

Laboratory duplicates and method blanks must be carried through the entire preparation and analytical procedures.

At a minimum the laboratory should follow all the performance and QC requirements in USEPA 8151A and USEPA 8000.

All applicable extraction cleanup steps as per USEPA 8151A must be performed for all samples and their respective QC samples including method blanks.

2.14 Action required if limits are exceeded

Initial Calibration

The initial calibration requirements must be met before any samples are analyzed. If any continuing calibration does not meet the required criteria, a new initial calibration sequence must be run. The initial calibration sequence must consist of a minimum of at least five (5) standard concentrations. If the calibration curve does not meet the required limit, fresh standards must be prepared and a new standard curve generated. If a sample concentration is at or exceeds the highest calibration standard, the sample should be reanalyzed using a dilution.

Calibration Verification

A mid-point continuing calibration QC check standard must be run at the beginning and end of every 12 hours of sample analysis per instrument. If standards do fall within the absolute retention windows the GC retention times should be corrected prior to analyzing samples. Results must be within $\pm$ 15% of the response calculated using the initial calibration. If control limits are not met, corrective actions must be taken, and a new continuing calibration check sample run. If the control limits are still not met, the analysis must be stopped, the problem corrected, and a new initial calibration check run. Sample analysis cannot begin until the control limits are met. To validate positive data, the continuing calibration check must also be acceptable at the end of every 12 hour period during which samples are analyzed. Samples must be reanalyzed if the ending continuing calibration check control limits are not met.

Method Blanks

All sample results must be associated with an acceptable method blank which was extracted within the same extraction time, batch, and matrix type as the samples. A method blank is required between a calibration run and the first sample run. Therefore, the same method blank extract may be analyzed more than once if the number of samples within a batch requires more than 12 hours of analyses. The method blank and the sample must be analyzed on the same instrument. If the method blank exceeds the control limits, corrective actions must be taken, a new method blank must be prepared and analyzed. Note action taken in the case narrative.

MS/MSD

The MS fortification solutions are to contain all the unlabeled analytes at concentrations corresponding to the calibration mid-point. The MD must have a recovery of at least 40-120%. The results obtained from the MD and MSD samples should agree within 20 percent relative difference. If the limits are not met: verify satisfactory instrument performance; if possible, verify that no error was made while weighing the sample portions; review the analytical procedure with the performing laboratory personnel; note the findings in the case narrative.

LCS

An LCS must be analyzed with each analytical batch of up to 20 samples. The LSC consists of an aliquot of a clean control matrix similar to the sample matrix and of the same weight and volume. The LCS is spiked with the same analytes at the same concentrations as the MS. When the results of the MS indicate a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix. If LCS results are outside limits the problem needs to be investigated and if necessary the batch of samples reanalyzed. Note findings in case narrative.

Surrogate Recovery

With each analysis, before sample extraction, spike each sample and standard with one or two herbicide surrogates. Develop statistically determined QC chart limits with recovery limits not more than 50-120%. QC check samples should be re-analyzed if surrogate recovery does not meet control limits. Note findings in case narrative.

Duplicate

If the limits are not met: verify satisfactory instrument performance; if possible, verify that no error was made while weighing the sample portions; review the analytical procedure with the performing laboratory personnel; note the findings in the case narrative.

Field Duplicate

The laboratory will not know which sample is the field duplicate; if the limits are exceeding for the field replicate, this will be addressed by the data validator.

Rinsate Blank

Any problems with the Rinsate blanks will be addressed by the data validator, not the laboratory.

2.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

3 STATEMENT OF WORK – METHYL MERCURY

3.1 General description of analytical service requested

Analysis of aqueous and sediment samples for methyl mercury.

3.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Aqueous	USEPA Method 1630 Methyl Mercury in Water by Distillation, Aqueous Ethylation, Purge and Trap, and CVAFS (EPA-821-R-01-020) or modified version giving equal or better performance
TBD [a]	Sediment	USEPA Method 1630 Methyl Mercury in Water by Distillation, Aqueous Ethylation, Purge and Trap, and CVAFS (EPA-821-R-01-020) with modifications including sample preparation steps for the extraction of sediment

3.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

3.4 Estimated date(s) of sample collection

May 2005 – December 2007.

3.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

3.6 Holding time and number of days to analysis

For aqueous sample follow the sample preservation and storage requirements in EPA Method 1630. Samples must be maintained at 0-4^{o}C from the time of collection until preservation. Aqueous samples must be acid-preserved within 48 hours.

Saline aqueous samples are preserved with 2 mL/L of 9 M H_2SO_4 solution. Acid-preserved samples are stable for at least six months, if kept dark and cool. Fresh water samples are preserved by adding 4 mL/L of concentrated HCL.

Sediment samples for methyl mercury have to be frozen upon collection, shipped frozen and stored frozen. Holding time is 28 days.

3.7 Analytical protocol required

Matrix	Analysis
Aqueous (Saline)	USEPA Method 1630 Methyl Mercury in Water by Distillation, Aqueous Ethylation, Purge and Trap, and CVAFS (EPA-821-R-01-020) or modified version giving equal or better performance
Sediment	USEPA Method 1630 Methyl Mercury in Water by Distillation, Aqueous Ethylation, Purge and Trap, and CVAFS (EPA-821-R-01-020) with modifications including sample preparation steps for the extraction of sediment

3.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory should adhere to USEPA Method 1630 protocols. Modifications to EPA 1630 allowed if the method's performance has been demonstrated and documented to make sure that it give equal or better performance. Modifications must include sample preparation steps appropriate for the extraction of sediment.

3.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request, and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory).

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit.
The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

3.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

3.11 Name of sampling/shipping contact

James McCann
17-17 Route 208 North
Second Floor
Fair Lawn, New Jersey 07410
201-398-4310 (direct)
201-797-7400 (office)
201-797-4399 (fax)
jmccann@pirnie.com

3.12 Data Requirements

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Matrix	Reporting Limit (RL)
Sediment	0.02 ng/g (ppb) (Dry weight)
Aqueous (Saline)	0.02 ng/L (ppt)

3.13 Quality Control Requirements

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Audits Required	Frequency	Limits
Matrix Spike (MS)	5% of field samples from site.	%R - 75-125%,
Matrix Spike Duplicate (MSD)	5 % of samples from site.	%R - 75-125% RPD - ≤ 25%
Method Blanks (Matrix for the blanks must match the sample matrix for the batch of samples)	Three method blanks should accompany each analytical batch.	< RL
Trip Blank	One with each set of samples and analyze immediately before samples	< RL
Rinsate Blank	Before sampling using sampler. Not to exceed one Rinsate per day of sampling, but at least weekly	< RL
Ongoing Precision and Recovery (OPR)	At the beginning of each analytical batch and at the end of each 12-hour shift.	The lab should plot OPR data on control charts and develop statement of lab quality for the analysis per EPA 1630, Section 9.5.3 and table 2.
Quality Control Standard (QCS)	Analyzed in the middle of each sample batch.	Compare to expected value for the QCS. Difference between the expected value and the results should not exceed ± 20%.
Field Duplicate	With each batch of samples	RPD ≤ 50%; evaluated for analytes >5 times the MDL.

Notes:

A sample batch is composed of a maximum of twenty (20) samples which have all been prepared on the same day.

Laboratory duplicates and method blanks must be carried through the entire preparation and analytical procedures.

All applicable extraction cleanup steps as per USEPA 1630 must be performed for all samples and their respective QC samples.

All the performance and quality control criteria in USEPA 1630 must be followed.

3.14 Action required if limits are exceeded

Matrix Spike/Matrix Spike Duplicate

If a MS exceed the recovery limits of 75-125%, verify satisfactory instrument performance. If the RPD exceeds 25%, verify that no error was made preparing the spikes, review the analytical procedure with the performing laboratory personnel and note the findings and correction actions in the case narrative.

Method Blank

The method blanks (distillation blanks) are prepared by distillation and analysis of acidify reagent water, exactly as if they were samples. Three method blanks should accompany each analytical batch. If above the limits, the lab should investigate the source of contamination. (Method blanks could be higher for solid sample matrix and sediments) If the method blank exceeds the control limits, corrective actions must be taken, a new method blank must be prepared and analyzed. Note finding in case narrative.

Trip Blank

If contamination is detected the sampling coordinator must notified. Note in the case narrative

Rinsate Blank

Any problems with the Rinsate blanks will be addressed by the data validator, not the laboratory.

Ongoing Precision and Recovery (OPR)

The OPR is a laboratory fortified method blank. If the OPR standard exceed the criteria given in EPA 1630, Section 9.5.3, the associated results are suspect. The problem needs to be investigated and correction action taken.

Quality Control Standard (QCS)

The QCS should be prepared from an independent source than used for standards. The difference between the expected value for the QCS and the result should not exceed be greater than ±20%. If the QCS exceeds the limits, investigate and correct the problem.

Field Duplicate

The laboratory will not know which sample is the field duplicate; if the limits are exceeding for the field replicate, this will be addressed by the data validator.

3.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case

[ ] Expedited – specify _____ days or by _____ date

4 STATEMENT OF WORK – ARSENIC SPECIES

4.1 General description of analytical service requested

Analysis of aqueous and sediment samples for arsenic species.

4.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Sediment	USEPA Method 1632 Chemical Speciation of Arsenic in Water and Tissue by Hydride Generation Quartz Furnace Atomic Absorption Spectrometry, Revision A with modifications plus vendor procedures to extract the As (III) and As (V) from sediment
TBD [a]	Aqueous (Saline)	USEPA Method 1632 Chemical Speciation of Arsenic in Water and Tissue by Hydride Generation Quartz Furnace Atomic Absorption Spectrometry, Revision A or modified version

4.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

4.4 Estimated date(s) of sample collection

May 2005 – December 2007

4.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

4.6 Holding time and number of days to analysis

Water samples should be acidified to pH of <2 with HCl and stored for less than 28 days at 4^{o}C. Store the preserved sample for a minimum of 48 hours at 0-4^{o}C to allow the As adsorbed on the container walls to completely dissolved in the acidified sample. Sample bottles should be stored in polyethylene bags at 4^{o}C until analysis.

Sediment samples should be collected with no headspace and preserved by cooling to 4^{o}C immediately after collection and not allowed to air dry during shipment. The holding time is 28 days. (Frozen samples can be stored for up to a year.)

4.7 Analytical protocol required

Matrix	Analysis
Sediment	USEPA Method 1632 Chemical Speciation of Arsenic in Water and Tissue by Hydride Generation Quartz Furnace Atomic Absorption Spectrometry, Revision A with modifications plus vendor procedures to extract the As (III) and As (V) from sediment
Aqueous	USEPA Method 1632 Chemical Speciation of Arsenic in Water and Tissue by Hydride Generation Quartz Furnace Atomic Absorption Spectrometry, Revision A or modified version

4.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory should adhere to all USEPA Method 1632 protocols.

4.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request, and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory).

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

4.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

4.11 Name of sampling/shipping contact

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jmccann@pirnie.com

4.12 Data Requirements

Compounds	**Reporting Limit (RL) Water (mg/L)**	**Reporting Limit (RL) For dry Sediment (m/kg)**
Arsenic	0.02	0.05
Arsenic (II)	0.01	0.05
Arsenic (V)	0.01	0.05

4.13 Quality Control Requirements

The following audits are required where applicable.

Audits Required	Frequency	Limits
Matrix Spike and Matrix Spike Duplicate (MS/MSD)	On 5% of the samples from the site or at least one MS/MSD for each sample set from the site, whichever is more frequent.	%R - 60-140% %RPD ≤20%; evaluated for analytes >5 times the MDL.
Method Blanks	For each analytical batch.	< RL
Rinsate Blank	Before sampling using a sampler. Not to exceed one Rinsate per day of sampling, but at least weekly	< RL
Ongoing Precision and Recovery	At the beginning of each analytical batch and at the end of each 12-hour shift.	For each matrix calculate %R and standard deviation of recovery (SR) per 1632 Section 9.6.5. %R - 60-140%
Quality Control Standard	Per batch of samples.	%R – 75-125%
Field Duplicates	Per sample batch	RPD ≤ 50%; evaluated for analytes >5 times the MDL.

Notes:

A sample batch is composed of a maximum of twenty (20) field samples plus associated QCs which have all been prepared on the same day.

Laboratory duplicates and method blanks must be carried through the entire preparation and analytical procedures.

All applicable extraction cleanup steps as per USEPA 1632 must be performed for all samples and their respective QC samples.

4.14 Action required if limits are exceeded

MS/MSD

If the MS recovery limits are not met verify satisfactory instrument performance or if for the MSD the RPD exceeds 20%, verify that no error was made preparing the spikes; review the analytical procedure with the performing laboratory personnel; note the findings in the case narrative.

Method Blank

Matrix for the blanks must match the sample matrix for the batch of samples. If above the RL for the matrix, the lab should halt the analysis and investigate the source of contamination. A fresh method blank should be reanalyzed. Note in the case narrative
.

Rinsate Blank

Any problems with the Rinsate blanks will be addressed by the data validator, not the laboratory.

Ongoing Precision and Recovery (OPR)

The OPR is a laboratory fortified method blank. If they exceed the limits any associated results maybe suspect. The problem needs to be investigated and corrective action taken.

Quality Control Standard (QCS)

The QCS is used to verify instrument calibration; The QCS should be prepared from an independent source other than used for standards. If the QCS exceeds recovery limits, investigate and recalibrate the instrument if necessary.

Field Duplicates

The laboratory will not know which sample is the field duplicate; if the limits are exceeding for the field replicate, this will be addressed by the data validator.

4.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

5 STATEMENT OF WORK – CHROMIUM HEXAVALENT (ppt levels)

5.1 General description of analytical service requested

Analysis of aqueous and sediment samples for ppt levels of Chromium Hexavalent.

5.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Aqueous	EPA Method SW-846-7199, Determination of Hexavalent Chromium in Drinking Water, Groundwater and Industrial Wastewater Effluents by Ion Chromatography with modifications for saline water or EPA Method 1636.
TBD [a]	Sediment	EPA Method SW-846-7199, Determination of Hexavalent Chromium in Drinking Water, Groundwater and Industrial Wastewater Effluents by Ion Chromatography (or method EPA 1636) with modifications including sample preparation procedure for sediment such as SW 846 3060A. .

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

5.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

5.4 Estimated date(s) of sample collection

May 2005 – December 2007.

5.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

5.6 Holding time and number of days to analysis

Aqueous samples must be stored at 0-4^{o}C and analyzed within 24 hours after collection. (For this project the 24 hour holding time will be considered as met if the lab analyzes the sample on the same day as same receipt.) Sediment samples should be collected with no head space and stored at 0-4^{o}C and not allowed to air dry during shipment and storage. The holding time is 30 days from collection and 7 days from extraction.

5.7 Analytical protocol required

MATRIX	ANALYSIS
Aqueous	EPA Method SW-846-7199, Determination of Hexavalent Chromium in Drinking Water, Groundwater and Industrial Wastewater Effluents by Ion Chromatography with modifications for saline water or EPA Method 1636.
Sediment	EPA Method SW-846-7199, Determination of Hexavalent Chromium in Drinking Water, Groundwater and Industrial Wastewater Effluents by Ion Chromatography (or method EPA 1636) with modifications including sample preparation procedure for sediment such as SW 846 3060A. .

5.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to all USEPA Method SW-846-7199 protocols.

5.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory.

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

5.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

5.11 Name of sampling/shipping contact

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5.12 Data Requirements

Matrix	Parameter	Reporting Limit (RL)
Aqueous	Chromium VI	1 ug/L
Sediment	Chromium VI	10 ug/kg (Dry Weight)

5.13 Quality Control Requirements

The following audits are required where applicable.

Audit required	Frequency of Audit	Limits
Method Blank	Per matrix, at least one per batch of 20 samples of less	<RL
Laboratory Duplicates	Per matrix, at least one per 10 samples	Compare the duplicate difference to statistically developed control chart limit with minimum limits of 20%.
Matrix Spike (MS)	Per matrix, at least one per batch of 20 samples	For aqueous %R – 85-115% For sediment %R – 75-125%
Laboratory Control Standard (LCS)	Analyze independently prepared check sample at least every 15 samples.	For aqueous samples within the statistically determined control limits of the expected value. (Recovery limits of < ±10 %). For sediment %R- 80-120%.
Rinsate Blank	Not to exceed one Rinsate blank per day of sampling, but at least one weekly	< RL
Field Duplicates	With each batch of samples	RPD ≤ 50%; evaluated for analytes >5 times the MDL.

Notes:

At a minimum the lab must follow the performance and quality assurance practices in SW846 7199 and SW 846 3060A.

A sample batch is composed of a maximum of twenty (20) field samples plus associated QCs which have all been prepared on the same day.

Laboratory duplicates must be carried through the entire preparation and analytical procedures.

5.14 Action required if limits are exceeded

Method Blank

If the method blank is above the detection limit investigate the problem prior to analyzing samples.

Laboratory Duplicate

A duplicate sample or a duplicate MS sample should be analyzed every ten samples. Compare the duplicate difference to statistically developed control chart limit with minimum limits of 20%. Duplicate analyses which exceed the control limits must be reported in the case narrative.

MS

When ever a new matrix is analyzed MS samples should be analyzed. MS analyses which exceed the control limits must be re-prepared and reanalyzed. Any problems encountered, as well as any corrective actions taken, must be reported in the case narrative.

LCS

The LCS must be analyzed using the same sample preparation, analytical method, and QA/QC procedures employed for the samples. If the LCS results fall outside the control limits, the problem corrected, and the samples associated with the out of control LCS reanalyzed.

Rinsate Blank

Any problems with the Rinsate blank will be addressed by the data validator, not the laboratory.

Field Duplicates

The laboratory will not know which sample is the field duplicate; if the limits are exceeding for the field replicate, this will be addressed by the data validator.

5.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

6 STATEMENT OF WORK – TOTAL PHOSPHORUS, ORTHOPHOSPHATE

6.1 General description of analytical service requested

Analysis of aqueous samples for total phosphorus and total orthophosphate.

6.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Aqueous	Phosphorus, Orthophosphate (Colorimetric, Ascorbic Acid Method) – EPA Method 365.2

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

6.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

6.4 Estimated date(s) of sample collection

May 2005 – December 2007.

6.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

6.6 Holding time and number of days to analysis

Samples must be stored at 4^{o}C and preserved to pH <2 with H_2SO_4. Maximum holding time for acid preserved samples is 28 days.

6.7 Analytical protocol required

Phosphorus, Orthophosphate (Colorimetric, Ascorbic Acid Method) – EPA Method 365.2

6.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to all USEPA Method 365.2 protocols.

6.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory.

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

6.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

6.11 Name of sampling/shipping contact

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6.12 Data Requirements

Matrix	Parameter	Reporting Limit (RL)
Aqueous	Total Phosphorus (P), Total Orthophosphate (P, ortho)	0.01 mg/L

Note: Specific quantification limits are highly matrix dependent. The laboratory determined method detection limit (MDL) should be at least a factor of three less than the RLs provided in this table.

6.13 Quality Control Requirements

The following audits are required where applicable.

Audit Required	Frequency of Audits	Limits
Method Blank	Per matrix, at least one per batch of 20 samples or less	< RL
Laboratory Duplicates	Per matrix, at least one per batch of 20 samples or less	RPD = 20%; evaluated for analytes >5 times the MDL.
Matrix Spike (MS)	Per matrix, at least one per batch of 20 samples or less	85-115 %R
Laboratory Control Standard (LCS)	Per batch of samples	$\pm$ 10% of the expected value
Field Duplicate	With each batch of 20 samples	RPD $\leq$ 50%; evaluated for analytes >5 times the MDL.
Rinsate Blank	Not to exceed one Rinsate blank per day of sampling, but at least one weekly	< RL

Notes:

A sample batch is composed of a maximum of twenty (20) field samples plus associated QC which have all been prepared on the same day.

Laboratory duplicates must be carried through the entire preparation and analytical procedures

6.14 Action required if limits are exceeded

Method Blank

Perform method blank using reagent water following the exact procedure used for field samples. If the method blank is above the detection limit investigate the problem prior to analyzing samples.

Laboratory Duplicate

Duplicate analyses which exceed the control limits must be reported in the case narrative.

MS

MS analyses which exceed the control limits must be re-prepared and reanalyzed. Any problems encountered, as well as any corrective actions taken, must be reported in the case narrative.

LCS

An LCS should be processed with each batch of samples. If the standards does not agree within ±10% of the true value investigate the problems. It maybe necessary to prepare are a new calibration. The samples associated with the out of control standard should be reanalyzed.

Field Duplicates

The laboratory will not know which sample is the field duplicate; if the limits are exceeding for the field replicate, this will be addressed by the data validator.

Rinsate Blank

Any problems with the Rinsate blank will be addressed by the data validator, not the laboratory.

6.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

7 STATEMENT OF WORK – NITROGEN (KJELDAHL)

7.1 General description of analytical service requested

Analysis of aqueous and sediment samples for Kjeldahl Nitrogen.

7.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Aqueous	EPA Method 351.3, Total Nitrogen, Kjeldahl (Colorimetric; Titrimetric; Potentiometric)
TBD [a]	Sediment	EPA Method 351.3, Total Nitrogen, Kjeldahl (Colorimetric; Titrimetric; Potentiometric)

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

7.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

7.4 Estimated date(s) of sample collection

May 2005 – December 2007.

7.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

7.6 Holding time and number of days to analysis

Aqueous and sediment samples must be stored at $4^{o}C$. Aqueous samples are also preserved to pH<2 with H_2SO_4. Maximum holding time is 28 days.

7.7 Analytical protocol required

EPA Method 351.3, Total Nitrogen, Kjeldahl (Colorimetric; Titrimetric; Potentiometric)

7.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to all USEPA Method 351.3 protocols.

7.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory.

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

7.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

7.11 Name of sampling/shipping contact

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7.12 Data Requirements

Matrix	Parameter	Reporting Limit
Aqueous	Nitrogen (Total Kjeldahl)	1 mg/L
Sediment	Nitrogen (Total Kjeldahl)	150 mg/kg (Dry Weight)

Note: Specific quantification limits are highly matrix dependent. The laboratory determined method detection limit (MDL) should be at least a factor of three less than the RLs provided in this table.

7.13 Quality Control Requirements

The following audits are required where applicable.

Audit required	Frequency of Audits	Limits
Method Blank	Per matrix, at least one per batch of 20 samples or less	< MDL
Duplicate	Per matrix, at least one per batch of 20 samples or less	For water RPD = 20%; evaluated for analytes >5 times the MDL. For sediments RPD = 35%; evaluated for analytes >5 times the MDL.
Matrix Spike (MS)	Per matrix, at least one per batch of 20 samples or less	75-125 %R
Laboratory Control Standard (LCS)	At least one per batch of 20 samples or less	90-110 %R
Field Duplicate	With each batch of 20 samples	RPD $\leq$ 50%; evaluated for analytes >5 times the MDL.

Notes:

A sample batch is composed of a maximum of twenty (20) field samples plus associated QCs which have all been prepared on the same day.

Laboratory duplicates must be carried through the entire preparation and analytical procedures.

7.14 Action required if limits are exceeded

Method Blank

Perform method blank using reagent water following the exact procedure used for field samples. If the method blank is above the detection investigate the problem prior to analyzing samples.

Duplicate

Duplicate sample analyses which exceed the control limits must be reported in the case narrative.

MS

MS analyses which exceed the control limits must be re-prepared and reanalyzed. Any problems encountered, as well as any corrective actions taken, must be reported in the case narrative.

LCS

The LCS must be analyzed using the same sample preparation, analytical method, and QA/QC procedures employed for the samples. If the LCS results fall outside the control limits, the analyses must be stopped, the problem corrected, and the samples associated with the out of control LCS reanalyzed.

Field Duplicates

The laboratory will not know which sample is the field duplicate; if the limits are exceeding for the field replicate, this will be addressed by the data validator.

7.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

8 STATEMENT OF WORK – SULFIDES

8.1 General description of analytical service requested

Analysis of aqueous samples for sulfides.

8.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Aqueous	EPA SW-846-9030B Acid-Soluble and Acid-Insoluble Sulfides: Distillation plus SW-846-9034 Titrimetric Procedure

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

8.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

8.4 Estimated date(s) of sample collection

May 2005 – December 2007.

8.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

8.6 Holding time and number of days to analysis

Samples are preserved with 4 drops of 2 N zinc acetate solution per 100 mL of sample and adjust pH to greater than 9 with 6N sodium hydroxide solution. Samples bottles are filled completely and stoppered with a minimum aeration. Samples must be cooled to. 4^{o}C , and stored headspace free. Maximum holding time for preserved samples is 7 days.

8.7 Analytical protocol required

EPA SW-846-9030B Acid-Soluble and Acid-Insoluble Sulfides: Distillation plus SW-846-9034 Titrimetric Procedure or method

8.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to all USEPA EPA SW-846-9030B protocols and requirements.

8.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory.

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit.
The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

8.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

8.11 Name of sampling/shipping contact

James McCann
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8.12 Data Requirements

Matrix	Parameter	Reporting Limit (QL)
Aqueous	Sulfides	0.5 mg/L

8.13 Quality Control Requirements

The following audits are required where applicable.

Audit required	Frequency of Audits	Limits
Method Blank	Per batch of 20 samples or less	= MDL
Laboratory Duplicates	Per batch of 20 samples or less	%RPD = 20%, evaluated for analytes 5 times the MDL.
Matrix Spike (MS)	Per each matrix, at least one per batch of 20 samples or less	75-125 %R
Laboratory Control Standard (LCS)	At least one per batch of samples	$\pm$ 25% of expected value
Field Duplicate	With each batch of 20 samples	RPD $\leq$ 50%; evaluated for analytes >5 times the MDL.

Notes:

A sample batch is composed of a maximum of twenty (20) field samples plus QC which have all been prepared on the same day.

Laboratory duplicates must be carried through the entire preparation and analytical procedures.

8.14 Action required if limits are exceeded

Method Blank

Perform method blank using reagent water following the exact procedure used for field samples. If the method blank is above the detection limit investigate the problem prior to analyzing samples.

Laboratory Duplicate

Duplicate analyses which exceed the control limits must be reported in the case narrative.

Matrix Spike

MS analyses which exceed the control limits must be re-prepared and reanalyzed. Any problems encountered, as well as any corrective actions taken, must be reported in the case narrative.

LCS

An LCS can be prepared with t known amount of sodium sulfide. The LCS must be analyzed using the same sample preparation, analytical method, and QA/QC procedures employed for the samples. If the LCS results fall outside the control limits, the problem should be corrected, and the samples associated with the out of control LCS reanalyzed.

Field Duplicates

The laboratory will not know which sample is the field duplicate; if the limits are exceeding for the field replicate, this will be addressed by the data validator.

8.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

9 STATEMENT OF WORK – AMMONIA

9.1 General description of analytical service requested

EPA Method 350.1 Determination of Ammonia Nitrogen by Semi-Automated Colorimetry, Revision 2.0 August 1993

9.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Aqueous	EPA Method 350.1 Determination of Ammonia Nitrogen by Semi-Automated Colorimetry, Revision 2.0 August 1993

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

9.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

9.4 Estimated date(s) of sample collection

May 2005 – December 2007.

9.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

9.6 Holding time and number of days to analysis

Samples are preserved with conc. H_2SO_4 to pH <2 and stored at 4^oC with no headspace.
Maximum holding time is 28 days.

9.7 Analytical protocol required

EPA Method 350.1 Determination of Ammonia Nitrogen by Semi-Automated Colorimetry, Revision 2.0 August 1993

9.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to all USEPA Method 350.1.

9.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory.

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit.
The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

9.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

9.11 Name of sampling/shipping contact

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9.12 Data Requirements

Matrix	Parameter	Reporting Limit (QL)
Aqueous	Ammonia as N	0.01 mg/L NH_3 as N

Note: Specific quantification limits are highly matrix dependent. The laboratory determined method detection limit (MDL) should be at least than the RLs provided in this table.

9.13 Quality Control Requirements

The following audits are required where applicable.

Audit Required	Frequency of Audits	Limits
Linear Calibration Range	Initially and every 6 months	$\pm$ 10% linearity
Method Blank (MB)	With each batch of samples	$\leq$ MDL
Fortified Blank (FB)	With each batch of samples	%R – 90-100%
Instrument Performance Check Solution (IPC)	Immediately following the daily calibration, after every 10 samples and at the end of the sample run.	Verify that the instrument is within $\pm$10% of calibration.
Matrix Spike	For 10% of the samples.	%R - 90-100%
Quality Control Standard (QCS).	Quarterly	$\pm$10% of established QSC value.
Field Duplicate Samples	With each batch of samples	RPD $\leq$ 50%; evaluated for analytes >5 times the MDL.

Notes:

A sample batch is composed of a maximum of twenty (20) field samples plus associated QC which have all been prepared on the same day.

Laboratory duplicates must be carried through the entire preparation and analytical procedures.

9.14 Action required if limits are exceeded

Linear Calibration Range

If any verification data exceeds the initial values by ±10%, linearity must be reestablished.

Method Blank

An aliquot of reagent water is treated as a sample and exposed in the same manner as samples to the lab environment. Data produced is used to assess contamination form the lab environment. If values exceed the MDL, laboratory or reagent contamination should be suspected and corrective action taken.

Fortified Blank(FB)

An aliquot of reagent water with a known quality of ammonia, from a source different than used for calibration, is added in the lab. The LFB is analyzed to determine if the method is in control and the lab can produce accurate and precise measurements. If recovery is outside 90-100%, the source of the problem must be identified and resolved before continuing analysis.

Instrument Performance Check (IPC)

An IPC (a mid-range check standard) and a calibration blank must be analyzed immediately after daily calibration, after every 10^{th} sample and at the end of a sample run. Analysis of the IPC must verify calibration within ±10%. If the calibration is outside limits, the IPC solution must be reanalyzed. If the second analysis of the IPC confirms that the calibration is outside limits, sample analysis must be discontinued and the cause determined. All samples following the last acceptable IPC solution must be reanalyzed.

Matrix Spike (MS)

The MS is an aliquot of an environmental sample to which a known quality of analyte is added in the laboratory. An MS must be analyzed with a minimum of 10% of samples and is used to determine whether sample matrix contributes bias to the analytical results. If the recovery calculated per EPA 350.1 section 9.4 is outside the recovery range of 90-100% and laboratory performance (Section 9.3) based on analyses of a MB, a FB and a ICP is in control, the recovery problem encountered with the MS is judged to be either matrix or solution related not system related. Document the problem in the case narrative.

Field Duplicates

The laboratory will not know which sample is the field duplicate; if the limits are exceeding for the field replicate, this will be addressed by the data validator.

9.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

10 STATEMENT OF WORK – METHANE

10.1 General description of analytical service requested

Determination of methane in water.

10.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Aqueous	USA EPA Region 1, Technical Guidance for the Natural Attenuation Indicators: Methane, Ethane and Ethene., NATATTEN, Revision 1, 2/21/02. Based upon Method: Analysis of Dissolved Methane, Ethane, and Ethene in Groundwater by a Standard Gas Chromatographic Technique, Don H. Kampbell and Steve A. Vandegrift, EPA, Ada, OK.J of Chrom Vol 36, May 1998

[a] It should be noted that the exact number of field samples plus associated QC will be field determined and is subject to change.

10.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

10.4 Estimated date(s) of sample collection

May 2005 – December 2007.

10.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

10.6 Holding time and number of days to analysis

Samples are preserved with 2 drops of 1:1 HCl with no bubbles or headspace and stored at $4^{o}C$.
Maximum holding time is 14 days.

10.7 Analytical protocol required

USA EPA Region 1, Technical Guidance for the Natural Attenuation Indicators: Methane, Ethane and Ethene., NATATTEN, Revision 1, 2/21/02.

10.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to all the protocol found in USA EPA Region 1, Technical Guidance for the Natural Attenuation Indicators: Methane, Ethane and Ethene., NATATTEN, Revision 1, 2/21/02.

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10.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory.

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

10.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

10.11 Name of sampling/shipping contact

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10.12 Data Requirements

Matrix	Parameters	Reporting limit (RL)
Aqueous	Methane	0.1 mg/L

10.13 Quality Control Requirements

The following audits are required where applicable.

AUDIT REQUIRED	FREQUENCY OF AUDIT	CRITERIA
Initial Calibration	Before analyzing samples.	At least 4 working standards bracketing the site samples. A regression coefficient (r^2) greater than 0.995
Method Detection Limit (MDL)	Annually	Methane < 0.05 mg/L
Continuing calibration check	Every 4 hours or 25 samples, whichever is more frequent. Also at the end of each sample batch.	Less than 20% difference from the true value
Laboratory Reagent Blank (LRB)	With each samples delivery group (SDG) - 20 field samples received, OR each 7 calendar day period during which samples are collected.	Methane < RL
Trip or Field Blank	With each SDG	Methane < RL
Field Duplicate	With each batch of 20 samples	RPD $\leq$ 50%; evaluated for analytes >5 times the MDL.
Matrix Spike (MS)	With each SDG	Recovery between 80-120%
Matrix Spike Duplicates (MSD)	With each SDG	Recovery between 80-120% Agreement between spikes within RPD $\leq$ 25%; evaluated for analytes >5 times the MDL.

Notes:

For this method, a samples delivery group (SDG) is composed of a maximum of twenty (20) field samples which have all been prepared on the same day.

10.14 Action required if limits are exceeded

Initial Calibration

An initial calibration with at least 4 working standards bracketing the site samples must be completed before samples are analyzed. The acceptance criteria is a regression coefficient (r^2) greater than 0.995 and the lowest gas standard should also have a signal/noise ratio greater than 5. If these criteria are not met the problem should be corrected before analyzing samples.

Method Detection Limit (MDL)

The MDL must be determined and than annually. If the acceptance criteria are not met, the problem must be corrected and the criteria met prior to analyzing field samples.

Continuing calibration check

The validity of the calibration is checked every 4 hours or 25 samples, whichever is more frequent, and at the end of each sample batch. The acceptance criteria are less than 20% difference from the true value. If the calibration change changed it is necessary to re-calibrate the instrument and reanalyze samples since the last good calibration.

Laboratory Reagent Blank (LRB)

The LRB is used to determine if interferences are present in the lab environment. A FRB is analyzed per samples SDG, OR each 7 calendar day period during which samples are collected. The LRB criteria must be met before field samples are analyzed.

Trip or Field Blank

The purpose of the field or trip blank is to determine if method or other interferences are present in the field environment. Data must be flagged with a qualifier if the acceptance criteria are not met. The sampling coordinator should be notified to correct the problem before more samples are collected.

Field Duplicates

Field duplicates are a measure of the precision associated with the sample collection, preservation, and storage, as well as with laboratory procedures. The laboratory may not know which are the duplicate samples.

Matrix Spike (MS)

If the recovery limits are not met the problem should be investigated. If insufficient sample is available for a matrix spike, the laboratory should analyze a Laboratory Fortified Blank (LFB) with the same acceptance criteria recovery of 80-120%. Data must be flagged with a qualifier if the acceptance criteria are not met.

Matrix Spike Duplicates (MSD)

If the acceptance criteria (% recovery and RPD) for the MSD are not met the problem should be investigated. Data must be flagged with a qualifier if the acceptance criteria are not met.

10.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

11 STATEMENT OF WORK – ACID VOLATILE SUFIDE AND SIMULTANEOUS EXTRACTABLE METALS

11.1 General description of analytical service requested

Analysis of sediment samples for acid volatile sulfide and simulaneously extractable metals.

11.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Concentration	Parameter	Analysis
TBD [a]	Sediment	Low	Acid Volatile Sulfide (AVS) and Simultaneously Extracted Metals (SEM) – cadmium, copper, lead, mercury, nickel, zinc, plus antimony, bismuth and chromium	EPA 821-R-91-100, Draft Analytical Method for Determination of Acid Volatile Sulfide and Selected Simultaneously Extractable Metals in Sediment, December 1991

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

11.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

11.4 Estimated date(s) of sample collection

May 2005 – December 2007.

11.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

11.6 Holding time and number of days to analysis

Samples should be stored at $4^{o}C$ with no headspace. Holding time is 14 days.

11.7 Analytical protocol required

The lab must follow all the performance and QC requirements given in EPA 821-R-91-100 for AVS, plus all QCs associated with extractable metals found in EPA-600/4-79-020 plus EPA approved methods used for metals.

11.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The annual calibrations, historical backgrounds, and other relevant quality control data must be included in each data package.

The maximum number of samples in an SDG comprising an analytical batch is twenty (20) field samples. A sample receipt checklist (Attachment 1) must be filled out for every sample delivery received by the laboratory. All of the checklists associated with an SDG must be included in the data package. Any problems with sample check-in must be reported to the Malcolm Pirnie representative immediately. The laboratory shall be required to electronically report sample check-in results daily on a web page developed by Malcolm Pirnie.

11.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory.

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

11.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis the laboratory must supply a detailed example calculation that clearly demonstrates the manner in which the initial and final result was derived. Where applicable, each component of the calculation must be explained.

The laboratory will be required to homogenize sediment samples prior to analysis.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

11.11 Name of sampling/shipping contact

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11.12 Data Requirements

Matrix	**Parameters**	**Reporting Limit (RL) *U*moles/g**
Sediment	Acid Volatile Sulfide (AVS)	0.01 (dry weight of sediment)
Sediment extract	SEM-cadmium, mg/kg	1
	SEM-copper, mg/kg	1
	SEM-lead, mg/kg	0.5
	SEM-mercury, mg/kg	0.02
	SEM-nickel,mg/kg	0.5
	SEM-zinc, mg/kg	1

11.13 Quality Control Requirements

The lab must follow all the performance and QC requirements given in EPA 821-R-91-100 for AVS, plus all QCs associated with extractable metals found in EPA-SW-846-6010B or other EPA approved methods used for metals.

Required QC for AVS

Audit Required	Frequency of Audits	Limits
Calibration verification for colorimetric or ion-selective electrode options using known sodium sulfide QCS standard.	At the beginning and end of each batch of samples.	Per EPA 821-R-100, Section 9, analysis of known sodium sulfide QC standard should give recoveries of 85-115% of the expected.
Laboratory Reagent Blank (LRB)	With each batch of samples	<RL
Laboratory Fortified Blank (LFB)	With each batch of 20 samples or less	%R - 80-110%
Laboratory Fortified Sample Matrix (LFM)	To a minimum of 10% of samples or per set of 20 samples, which ever is greater.	%R - 80-110%
Field Duplicate	With each batch of samples	RPD $\leq$ 50%, evaluated for analytes > 5 times the MDL
Rinsate Blank	Not to exceed one Rinsate per day of sampling, but at least one weekly	<RL

Required QC for SEM

Audit Required	Frequency of Audits	Limits
Method Blank	per batch	<RL
Calibration Blank		Within three times the IDL
Calibration Verification	Every 10 samples	within 15% of expected value
Matrix Spike	per batch	Recovery within $\pm$ 25% of actual value
Matrix Spike Duplicate	per batch	RPD $\leq$ 20%; evaluated for analytes >5 times the MDL.
Interference check sample	At beginning of each analytical run	$\pm$ 20% of true value

Note: The lab should follow the QA/QCs the EPA approved method(s) used to measure the metals.

11.14 Action required if limits are exceeded

Action required for AVS

Calibration Verification

A QCS must be analyzed immediately initially after calibrations and at the beginning and end of each batch of samples. Analysis of the QCS for AVS must have a recovery of 85-115%. If the QCS confirms that the calibration is outside limits, the problem needs to be investigated and corrected and if necessary the instrument recalibrated. Samples need to be reanalyzed.

LRB

An aliquot of reagent water is treated as a sample and exposed in the same manner as samples to the lab environment. Date produced is used to assess contamination form the lab environment. If values exceed the RL, laboratory or reagent contamination should be suspected and corrective action taken.

LFB

An aliquot of reagent water with a known quality of the analyte, from a source different than used for calibration, is added in the lab. The LFB is analyzed exactly like a sample to determine if the mythology is in control and the lab can produce accurate and precise measurements. If recovery is outside 80-115%, the source of the problem must be identified and resolved before continuing analysis.

LFM

The LFM is an aliquot of an environmental sample to which a known quality of analyte is added in the laboratory. An LFM must be analyzed with a minimum of 10% of samples and is used to determine whether sample matrix contributes bias to the analytical results. If the recovery calculated per section 10.4.2 of the method is outside the recovery range of 85-105% and laboratory performance is in control, the recovery problem encountered with the LFM is than judged to be either matrix or solution related not system related. Document the problem.

Field Duplicates

The laboratory will not know which sample is the field duplicate; if the limits are exceeding for the field replicate, this will be addressed by the data validator.

Rinsate Blank

If contamination is detected, the sampling coordinator should be notified so corrective action can be taken before the next sampling event.

Action Required for SEM

Method Blank

The method blank must contain all the reagents in the same volumes as used in the processing of the samples. If the method blank is above the detection limit investigate the problem prior to analyzing samples.

Calibration Verification

The results of the check sample used to verify calibration should agree within 15% of the expected value; if not terminate the analysis, correct the problem, and recalibrate the instrument and repeat analyses since the last acceptable check sample.

Matrix Spike (MS) and Matrix Spike Duplicate

If the recovery limits are not met the problem should be investigated and corrected. If the acceptance criteria (% recovery and RPD) for the MSD are not met the problem must be investigated. Refer to sections 8.4 and 8.5 of method 6010B.

Interference Check Sample

Results should be within +20% of the true value. It they exceed this value investigate and correct the problem before proceeding with the analysis.

11.15 QA/QC problems are to be noted in the case narrative and immediately reported to the Malcolm Pirnie representative. If further assistance is required, the Malcolm Pirnie representative should be contacted for instruction Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

12 STATEMENT OF WORK – TOTAL ORGANIC CARBON (TOC) AND TOTAL DISSOLVED CARBON (DOC)

12.1 General description of analytical service requested

Analysis of sediment samples for TOC and aqueous samples for TOC and DOC.

12.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Aqueous	EPA SW-846-9060, Total Organic Carbon. To measure Dissolved Organic Carbon (DOC) a portion of the aqueous sample must be first filtered through a 0.45 *u*m filter
TBD [a]	Sediments	Analyzed for TOC according to the method "Determination of Total Organic Carbon in Sediment," July 27, 1988, by L. Kahn of USEPA.

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

12.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – Remedial Investigation and Feasibility Study (RI/FS).

12.4 Estimated date(s) of sample collection

May 2005 – December 2007.

12.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

12.6 Holding time and number of days to analysis

Aqueous samples for TOC analysis if preserved with $H_2SO_4$to pH<2 and cooled to 4^oC holding time is up to 28 day. Samples for DOC should be filtered within 48 hours and than acidified with $H_2SO_4$to pH<2 than cooled to 4^oC and can be held for up to 28 days.

For sediment samples preserve the sample at 4^oC for up to 28 days.

12.7 Analytical protocol required.

Matrix	Analysis
Whole Water	EPA SW-846-9060, Total Organic Carbon. To measure Dissolved Organic Carbon (DOC)
Filtered Water	EPA SW-846-9060, Total Organic Carbon. To measure Dissolved Organic Carbon (DOC) an aqueous sample previously filtered through a 0.45 *u*m filter
Sediment	Analyzed for TOC according to the method "Determination of Total Organic Carbon in Sediment," July 27, 1988, by L. Kahn of USEPA Region 2.

12.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.)

The laboratory must adhere to the protocols in EPA SW-846-9060, and the method described in "Determination of Total Organic Carbon in Sediment," July 27, 1988, by L. Kahn of USEPA.

12.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory.

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

12.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

12.11 Name of sampling/shipping contact

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12.12 Data Requirements

Matrix	Parameter	Reporting Limit (RL)
Sediment	Total Organic Carbon (TOC)	100 mg/kg
Whole Water	Total Organic Carbon (TOC)	1mg/L
Water filtered through a 0.45 *u*m filter	Dissolved Organic Carbon (DOC)	1mg/L

12.13 Quality Control Requirements

The following audits are required where applicable.

Audits Required	Frequency of Audits	Limits
Instrument Calibration	Daily, prior to sample analysis	90 - 110 % R
Preparation Blank	1 per sample batch	≤RL
Mid-range Continuing Calibration Verification (CCV)	Immediately after the instrument calibration and 1 per 10 samples	80 - 120 % R
Continuing Calibration Blank	Immediately after the mid-range CCV and 1 per 10 samples	≤ MDL
Duplicate Analysis	Every sample	RPD ≤ 20%
Quadruplicate Analysis (For sediments)	1 per sample batch of sediment samples and for each sample with an aliquot < 50 mg	< 3 standard deviations
Field Duplicate	With each batch of 20 samples	RPD ≤ 50%; evaluated for analytes >5 times the MDL.

Notes:

A sample batch is composed of a maximum of twenty (20) field samples plus associated QC which have all been prepared on the same day.

Laboratory duplicates must be carried through the entire preparation and analytical procedure.

12.14 Action required if limits are exceeded

Instrument Calibration

Instrument calibration is to be performed daily prior to analysis according to the instrument manufacturer's instructions. The initial calibration sequence shall consist of a minimum of at least four (4) standards; one (1) blank and three (3) standards in graduated amounts which bracket the expected range of analysis. One (1) calibration standard must be near the instrument's

detection limit. If the initial calibration curve does not meet the required limit, the curve must be rerun. The control limit must be met prior to sample analysis. The true values and the source of the verification standards and identification information must be supplied. For samples which exceed the calibration range, a new calibration curve must be prepared which encompasses a higher concentration range. The laboratory must demonstrate that the calibration curve is linear throughout the extended range.

Preparation Blank

The preparation blank must follow the exact analytical procedure as the field samples. All positive sample results must be associated with an acceptable blank. If the preparation blank exceeds the control limits, the instrument should be recalibrated and the preparation blank re-prepared and reanalyzed. The blank acceptance criteria must be met prior to sample analysis.

Mid-Range Continuing Calibration Verification (CVC)

If the mid-range continuing calibration verification control limits are not met, the analysis must be stopped and the problem corrected. The instrument will then be recalibrated, the calibration verified, and all the samples since the last compliant mid-range calibration verification will be reanalyzed. All positive detections must be associated with an acceptable calibration. The initial calibration verification standard must be prepared from a source other than that used to prepare the calibration standards.

Continuing Calibration Blank (CCB)

All positive sample results must be associated with an acceptable CCB. If the CCB exceeds the control limits, the analysis must be stopped and the problem corrected. The preceding ten (10) samples analyzed since the last compliant CCB must also be reanalyzed.

Duplicates

Duplicate analyses which exceed the control limits must be reported in the case Narrative.

Quadruplicate Analysis

For sediment samples take one sample per batch of 20 or less and analyze in quadruplicate and for each sediment sample with an aliquot < 50 mg. calculate the standard deviation. If the sample being run in quadruplicate exceeds the control limits, the analysis must be stopped and the problem identified. All the samples in that batch, as well as the quadruplicate sample, must be rerun. The laboratory should report both determinations.

Field Duplicates

The laboratory will not know which sample is the field duplicate; if the limits are exceeding for the field replicate, this will be addressed by the data validator.

12.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

13 STATEMENT OF WORK – PARTICULATE ORGANIC CARBON (POC)

13.1 General description of analytical service requested

Analysis of aqueous samples for POC

.

13.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Aqueous	Particulate organic carbon by USEPA Method 440.0

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

13.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – Remedial Investigation and Feasibility Study (RI/FS).

13.4 Estimated date(s) of sample collection

May 2005 – December 2007.

13.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

13.6 Holding time and number of days to analysis

Samples should be collected on filters or the water filtered within 5 days of collection if stored at 4^{o}C. Store the filtered sample pads by freezing at -20°C, or store in a desiccator after drying at 103°C-105°C for 24 hours. Holding time should not exceed 100 days. (see method 440.0 for details)

13.7 Analytical protocol required.

Matrix	Analysis
Aqueous	USEPA Method 440.0 Determination of Carbon and Nitrogen in Sediment and Particulates of Estuarine/Coastal Waters Using Elemental Analysis (refer to section 11.4 for determination of particulate organic carbon (POC))

13.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.)

The laboratory must adhere to USEPA Method 440.0 protocols.

13.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory.

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit.

The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

13.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

13.11 Name of sampling/shipping contact

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13.12 Data Requirements

The method detection limit for Particulate Organic Carbon in aqueous samples is 62.3 µg carbon/L per Method 440.0 section 1.3. The laboratory reporting limit will be dependent on the volume of sample and the sample matrix.

13.13 Quality Control Requirements

The following audits are required where applicable.

Audit Requires	Frequency of Audit	Limit
Preparation Blank	1 per sample batch [a]	<RL
Laboratory Duplicate [b]	1 per sample batch	RPD 20 % evaluated for analytes >5 times the MDL.
Laboratory Fortified Blank	1 per sample batch	± 25%
Laboratory Fortified Sample Matrix	1 per sample batch	± 25%

[a] A sample batch is composed of a maximum of twenty field samples plus QC , which have all been prepared on the same day.
[b] Laboratory duplicates must be carried through the entire preparation and analytical procedure.

13.14 Action required if limits are exceeded

Preparation Blank
The preparation blank must follow the exact analytical procedure as the field samples. All positive sample results must be associated with an acceptable blank. If the preparation blank exceeds the control limit, then the instrument should be recalibrated and the preparation blank re-prepared and re-analyzed. The blank acceptance criteria must be met prior to sample analysis.

Laboratory Duplicate
Duplicate sample analyses, which exceed the control limits, must be reported in the case narrative.

Laboratory Fortified Blank
Known quantities of the method analytes are added to an aliquot of reagent water, or other blank matrices, in the laboratory. This blank is analyzed exactly like a sample, and its purpose is to determine whether the method is in control, and whether the laboratory is capable of making accurate and precise measurements (see USEPA Method 440.0, Part 3.14)

Laboratory Fortified Sample Matrix

Known quantities of the method analytes are added to an aliquot of an environmental sample in the laboratory. This laboratory fortified sample matrix is analyzed exactly like a sample, and its purpose is to determine whether the sample matrix contributes bias to the analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate aliquot and the measured values in the laboratory fortified sample matrix corrected for background concentrations (see USEPA Method 440.0, Part 3.15).

13.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

14 STATEMENT OF WORK – SCREENING FOR METALS BY FIELD PORTABLE X-RAY FLUORESCENCE

14.1 General description of analytical service requested

Provide on-site metals screening of sediment samples for metals using field portable X-ray fluorescence spectrometry .

14.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Concentration	Parameter	Analysis
TBD [a]	Sediment	Low	Metals – TAL metal plus titanium.	EPA SW-846-6200 Field Portable X-Ray Fluorescence Spectrometry For The Determination of Elemental Concentrations in Soil and Sediment

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

14.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

14.4 Estimated date(s) of sample collection

May 2005 – December 2007.

14.5 Estimated method of shipment

This is a screening test so samples must be analyzed on-site or in a near-by location. If it is necessary to ship samples, they must be shipped in accordance with USEPA and USDOT sample shipping protocols, and shipped as soon as possible after collection since results are due within 24 hours.

14.6 Holding time and number of days to analysis

Samples should be stored at 4^{o}C. Holding time is up to 6 months, but samples should be analyzed as soon as possible, since this is a screening test.

14.7 Analytical protocol required

EPA SW-846-6200 Field Portable X-Ray Fluorescence Spectrometry For The Determination of Elemental Concentrations in Soil and Sediment

14.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The annual calibrations, historical backgrounds, and other relevant quality control data must be included in each data package.

The maximum number of samples in an SDG comprising an analytical batch is twenty (20) field samples. A sample receipt checklist (Attachment 1) must be filled out for every sample delivery received by the laboratory. All of the checklists associated with an SDG must be included in the data package. Any problems with sample check-in must be reported to the Malcolm Pirnie representative immediately. The laboratory shall be required to electronically report sample check-in results daily on a web page developed by Malcolm Pirnie.

14.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory.

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

14.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis the laboratory must supply a detailed example calculation that clearly demonstrates the manner in which the initial and final result was derived. Where applicable, each component of the calculation must be explained.

The laboratory will be required to homogenize the sediment samples prior to analysis.

14.11 Name of sampling/shipping contact

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14.12 Data Requirements

Matrix	Parameters	Reporting Limit
Sediment	Trace Metals	mg/kg levels (ppm) See SW-846-6200 Table 1.

14.13 Quality Control Requirements

Audit required	Frequency of Audit	Limit
Energy Calibration Check	Beginning and end of each work day or if drift is occurring during analysis.	Manufacture's recommended criteria for the check
Method Blank	Daily	$\leq$ 3 times MDL
Calibration Verification Checks	At the beginning of each work day, during active analysis, and at the end of the work day.	Within ± 20% of the true values
Precision Measurements	At least one per day, each precision sample should be analyzed 7 times in replicate	RSD should be <20% with the exception of Cr. For Cr, RSD should be <30%
Detection Limits	Whenever a change is made in equipment or conditions which could affect the detection limits.	Detection limits will be used by the operator to evaluate each measurement for its usability
Confirmatory Samples	A minimum of one split sample analyzed for each 20 samples analyzed by XRF.	A correlation coefficient of at least 0.7 to be considered screening level data.
Field Duplicate	With each batch of samples	RPD < 50%; evaluated for analytes >5 times the MDL.

Notes:

A sample batch is composed of a maximum of twenty (20) field samples plus QC which have all been prepared on the same day.

Since this is intended only to be used a screening method QA/QC maybe re-evaluated and as the project progresses.

14.14 Action required if limits are exceeded

Energy Calibration Check

If the energy calibration check does not meet the manufacture's criteria, then the pure element samples should be repositioned and reanalyzed. If still not met, then an energy calibration should be performed per the manufacture's manual or software.

Method Blank

The method blank is used to monitor for laboratory-induced contaminations or interferences. If the method blank is above the detection limit investigate the problem prior to analyzing samples. All samples prior to the method blank should be reanalyzed.

Calibration Verification Checks

If site-specific sample is not available, then an NIST or other SRM can be used to verify the accuracy. Each target analyte must be within $\pm$20% (% difference) of the true value of the calibration check. If the measured value falls outside the accepted range it should be reanalyzed. If still outside the range the instrument should be recalibrated. The sample batch before the unacceptable calibration verification check must be reanalyzed.

Precision Measurements

Each precision sample should be analyzed 7 times in replicate. The Relative standard deviation (RSD) should not be greater the 20% except for Chromium which must not be greater then 30 percent.

Detection Limits

Replicate analyses of a low-concentration sample, SRM or other reference can be used to generate site-specific method detection and Quantitation limits Detection limits can also be determined using counting statistics. . Detection limits should be used by the operator to evaluate each measurement for its usability. Counting times can be increased to lower detection limits.

Confirmatory Samples

The confirmatory samples must be spits of well homogenized sample material. They should be selected from lower, middle, and upper range of concentrations measured by XFR. A correlation coefficient with the confirmatory method data of at least 0.7 is required for the XRF data to be considered screening level data. If less than this criteria, the difference should be investigated. The data is not valid for screening the analyte in question unless the problem is corrected.

Field Duplicates

If they exceed the limits, corrective action should be taken. Samples may not be sufficiently homogenized. The problem should be corrected and additional field duplicates should be taken.

14.15 QA/QC problems are to be noted in the case narrative and immediately reported to the Malcolm Pirnie representative. If further assistance is required, the Malcolm Pirnie representative should be contacted for instruction Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 24 hours after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

15 STATEMENT OF WORK – DIOXIN/FURAN AND PCB TEQ SCREENING BY IMMUNOASSAY

15.1 General description of analytical service requested

Provide screening for Dioxin/Furan and PCB in sediment samples by immunoassay .

15.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Concentration	Parameters	Analysis
TBD [a]	Sediment	Low ppt	Dioxin/Furan TEQ and PCB TEQ	A modified version of EPA SW-846-4025, Screening for Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans (PCDD/Fs) by Immunoassay. The modifications to 4025 with cleanup based upon portions of 8290 cleanup allow for screening for Dioxin/Furan TEQ and PCB TEQ. The method is based upon Cape-Technologies DF-1 Dioxin/Furan Immunoassay Kit plus thePCB1 Insert (IN-PCB1).

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

15.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

15.4 Estimated date(s) of sample collection

May 2005 – December 2007.

15.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

15.6 Holding time and number of days to analysis

If store at <10^{o}C solid, multiphase samples can be stored for up to one year. Sample extracts can be stored at <10^{o}C for up to one year.

15.7 Analytical protocol required

Dibenzofurans (PCDD/Fs) by Immunoassay. The modifications to 4025 with cleanup based upon portions of 8290 cleanup allow for screening for Dioxin/Furan TEQ and PCB TEQ. The method is based upon Cape-Technologies DF-1 Dioxin/Furan Immunoassay Kit plus thePCB1 Insert (IN-PCB1).

Information is available directly from Cape-Tech, e-mail: cape-tech@ceemaine.org.

15.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The annual calibrations, historical backgrounds, and other relevant quality control data must be included in each data package.

The maximum number of samples in an SDG comprising an analytical batch is twenty field samples (20). A sample receipt checklist (Attachment 1) must be filled out for every sample delivery received by the laboratory. All of the checklists associated with an SDG must be included in the data package. Any problems with sample check-in must be reported to the Malcolm Pirnie representative immediately. The laboratory shall be required to electronically report sample check-in results daily on a web page developed by Malcolm Pirnie.

15.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory.

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

15.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis the laboratory must supply a detailed example calculation that clearly demonstrates the manner in which the initial and final result was derived. Where applicable, each component of the calculation must be explained.

The laboratory will be required to homogenize sediment samples prior to analysis.

15.11 Name of sampling/shipping contact

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15.12 Data Requirements

Matrix	**Parameter**	**Reporting Limit (Dry Weight)**
Sediment	Total Dioxin/Furan TEQ ($TEQ_{D/F}$)	Approx. 20 pg/g
	Total Coplanar PCB TEQ (TEQ_{PCB})	Approx. 20 pg/g

Note: The Immunoassay kits should not be viewed as producing an equivalent measurement value to HRCG-HRMS TEQ, but as a screening value only to approximated HRGC-HRMS determined Dioxin and PCB TEQ.

15.13 Quality Control Requirements

Audit required	Frequency of audit	Limits
Initial Site/Matrix Split Sample Correlation	Before full scale implementation of the technique for the project	The Immunoassay results will be correlated with Dioxin data provided by an approved lab by HRGC-HRMS (1613 for Dioxins/Furans and 1668A for PCBs) on at least 20 split samples.
On going split sample conformation	At least 10 percent of the samples for the first 200 samples. After that the frequency will be re-evaluated.	Document – These data will provide confirmation of the method correlation. The ideal RPD between methods would be <25%.
Method Detection Limit	Prior to the lab analyzing environmental samples and whenever a change is made in the method which could change the detection limit	Sufficient to meet requirements for screening reporting Limit of 20 ppt TEQ
Method Blank	For each matrix, at least one per batch of 20 samples	< RL
Matrix Spikes	For each matrix, at least one per batch of 20 samples	Recovery greater than 40%
Standard Reference Material (SRM)	Initially at the beginning of the project and than at least semi-annually	± 35% of expected
Fortified Method Blank (FMB)	At least one per 20 samples	± 30% of expected
Duplicate	Weekly when samples are tested	RPD < 50% evaluated for analytes >5 times the MDL.

Note: Since this is intended only to be used a screening method QA/QC maybe re-evaluated and as the project progresses.

15.14 Action required if limits are exceeded

Initial Site/Matrix Split Sample Correlation

Initial site and matrix specific split sample correlation studies will be conducted on a set of approximately 20 samples with dioxin including sample with results blow the reporting limits and at least an order of magnitude above the reporting limit. This will be completed prior to full scale implementation of the technique for the project. The Immunoassay results will be correlated with dioxin data provided by an approved CLA lab by HRGC-HRMS. From this data calibration adjustment factors will be determined. Since the HRGC-HRMS method employs internal standards to correct for sample preparation efficiencies, for this study the HRGC-HRMS data will be considered as having no bias. For this study a correlation coefficient of 0.80 would be considered to be suitable. If these criteria can not be achieve the problem will be documented.

On Going Split Sample Confirmation

Split sample analyses for dioxins on 10% of the first 200 samples by HRGC-HRMS will be used for on-going confirmation and possible further optimization of the calibration adjustment factors. After the first 200 samples the need and frequency for confirmation samples will be reevaluated. These data will provide confirmation of the method correlation.

Method Detection Limit (MDL)

Prior to the lab analyzing environmental samples and whenever a change is made in the method, which would alter the detection limit. The MLD should be low enough to support the screening reporting limit.

Method Blank

If the method blank is above the detection limit investigate the source of the problem prior to analyzing samples.

Matrix Spike(MS)

Record the MS recovery for the matrix and report in the case narrative.

Standard Reference Materials (SRMs)

If the SRM result does not meet expected values the cause of the problem should be investigated prior to analyzing samples.

Fortified Method Blank (FMB)

If the result falls outside the control limits, another FMB should be analyzed. If this is also outside the limits the problem must be investigated further and documented.

Duplicates

If the limits are exceeded for the duplicate, record in the case narrative.

15.15 QA/QC problems are to be noted in the case narrative and immediately reported to the Malcolm Pirnie representative. If further assistance is required, the Malcolm Pirnie representative should be contacted for instruction Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 7 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

16 STATEMENT OF WORK – DIOXINS FURANS BY HRGC-LRMS

16.1 General description of analytical service requested

Analysis of aqueous and sediment samples for Dioxins and Furans by HRGC-LRMS

16.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD[a]	Sediment/Aqueous	USEPA Method SW-846 8280A, The Analysis of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans by High Resolution Gas Chromatography/Low Resolution Mass Spectrometry (HRGC/LRMS)

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

16.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

16.4 Estimated date(s) of sample collection

May 2005 – December 2007.

16.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

16.6 Holding time and number of days to analysis

Samples and extracts should be stored at 4^{o}C. Samples can be held 7 days to extraction and 40 days after extraction. (It is recommended that sediment samples also be handled in the same manner.)

16.7 Analytical protocol required

USEPA Method SW-846 8280A, The Analysis of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans by High Resolution Gas Chromatography/Low Resolution Mass Spectrometry (HRGC/LRMS)

16.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The annual calibrations, historical backgrounds, and other relevant quality control data must be included in each data package.

The maximum number of samples in an SDG comprising an analytical batch is twenty (20) field samples. A sample receipt checklist (Attachment 1) must be filled out for every sample delivery received by the laboratory. All of the checklists associated with an SDG must be included in the data package. Any problems with sample check-in must be reported to the Malcolm Pirnie representative immediately. The laboratory shall be required to electronically report sample check-in results daily on a web page developed by Malcolm Pirnie.

16.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory.

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example

EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

16.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis the laboratory must supply a detailed example calculation that clearly demonstrates the manner in which the initial and final result was derived. Where applicable, each component of the calculation must be explained.

The laboratory will be required to homogenize sediment samples prior to analysis.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

16.11 Name of sampling/shipping contact

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jmccann@pirnie.com

16.12 Data Requirements

Compounds	**Reporting Limit (RL) Water (ng/L)**	**Reporting Limit (RL) (ug/kg) for dry sediment**
2,3,7,8-TCDF	10	1.0
2,3,7,8-TCDD	10	1.0
1,2,3,7,8-PeCDF	25	2.5
2,3,4,7,8-PeCDF	25	2.5
1,2,3,7,8-PeCDD	25	2.5
1,2,3,4,7,8-HxCDF	25	2.5
1,2,3,6,7,8-HxCDF	25	2.5
1,2,3,4,7,9-HxCDF	25	2.5
2,3,4,6,7,8-HxCDF	25	2.5
1,2,3,4,7,8-HxCDD	25	2.5
1,2,3,6,7,8-HxCDD	25	2.5
1,2,3,4,7,9-HxCDD	25	2.5
1,2,3,4,6,7,8-HpCDF	25	2.5
1,2,3,4,7,8,9-HpCDF	25	2.5
1,2,3,4,6,7,8-HpCDD	25	2.5
OCDF	50	5.0
OCDD	50	5.0

Notes: Specific detection limits are highly matrix dependent. The laboratory-determined method detection limit (MDL) must be at least a factor of three less than the RL provided in this table.
The MDLs will vary dependent upon the sample matrix and the cleanup procedures employed.

16.13 Quality Control Requirements

AUDITS REQUIRED	FREQUENCY OF AUDITS	LIMITS
Mass Spectrometer Resolution	Prior to initial calibration and when any changes are made which could affect the instrument resolution.	Tune for maximum sensitivity of m/z 414 and m/z 502. (m/z 414 and m/z 502 should be 30-50% of m/z 264)
Retention Times and GC Resolution	Prior to initial calibration and continuing calibration or when any changes are made which could effect retention times	Window Defining Mix (WDM) is used to set retention time (RT) windows. 2,3,7,8 TCDD and the other TCDD isomers should be resolved with a valley of at least 25%.
Initial calibration	Initially prior to analyzing samples	At least a five point calibration for each analyte. Refer to 8280A table 9 for ion abundance ratios. Internal standard signal to noise ratio S/N>10:1 Unlabelled PCDDs/PCDFs S/N>2.5:1. %RSD≤15%. RTs consistent with WDM
Calibration Verification	At the beginning of each 12 hour period samples are analyzed.	Includes column resolution, ion abundance, and instrument sensitivity and response factor (RF) checks per 8082A section 7.13.3.6. Refer to 8280A table 9 for ion abundance ratios criteria. Internal standard S/N>10:1. Unlabelled PCDDs/PCDFs S/N>2.5:1. RF %Difference <30% from the average initial calibration. $^{13}C_{12}$-2,3,7,8-TCDD peak and the $^{10}C_{12}$-1,2,3,4-TCDD peak should be resolved with a valley of ≤25%. HxCDD and 1,2,3,6,7,8-HxCDD resolved with a valley ≤50%.
Method Blank	Per batch of samples	≤ MDL or less than 5% of the sample result for the sample analyte, whichever is greater and internal standard criteria met
System Blank	As required to clean system	< ½ QL
Internal Standards	Every sample, method blank or QC standard	Use statistically determined QC chart limits. %R -40-120%
Matrix Spike/Matrix Spike Duplicate	Per batch of samples	Compare to lab statistical control limits for recovery. Must meet the internal standard criteria, %RPD ≤35% for Water and ≤50% for sediment
Laboratory Control Standard (including natives)	Per batch of samples	Compare to lab statistical control limits for recovery. The recoveries for the natives should be 60-140%.

Recovery standard	Every sample, method blank and standard prior to instrument analysis	Refer to control criteria in 8280A table 9.
Duplicate	Per batch of samples	For water %RPD < 35%; evaluated for analytes >5 times the MDL. For sediment %RPD<50%; Evaluated for 5 times MDL.
Field Duplicate	Per batch of samples	For water %RPD < 35%; evaluated for analytes >5 times the MDL. For sediment %RPD<50%; evaluated for analytes >5 times the MDL.
Rinsate Blank	Not to exceed one Rinsate per day of sampling, but at least one weekly	< RL

Notes:

A sample batch is composed of a maximum of twenty (20) field samples plus QC which have all been prepared on the same day.

Laboratory duplicates and method blanks must be carried through the entire preparation and analytical procedures.

At a minimum the laboratory should follow all the performance and QC requirements in 8082A.

16.14 Action required if limits are exceeded

Mass Spectrometer Resolution
The mass spectrometer must be adjusted to meet the require resolution criteria.

Retention Times and GC Resolution
Gas chromatographic conditions must be adjusted until the required retention time and resolution criteria given in 8082A are achieved.

Initial Calibration
The calibration requirements must be met before samples are analyzed. Evaluate the system and repeat the calibration if it does not meet acceptance criteria given in 8082A.

Calibration Verification
If the calibration verification or continuing calibration control limits are still not met, the analysis must be stopped, the problem evaluated and corrected, and a new initial calibration check run as needed. Sample analysis cannot begin until the control limits are met.

Method Blank
If the method blank exceeds the control limits, corrective actions must be taken, a new method blank must be prepared and analyzed, and all the samples associated with the out of control blank should be re-prepared and reanalyzed.

System Blank

The system blank is used to clean the system as required. Continue to clean the system until the blank is acceptable.

Internal Standards

Develop statistically determined QC chart recovery limits not more than 25-150%. When results of the internal standards indicate atypical method performance for samples reanalyze the extract and if still outside limits re-extract to confirm matrix effect.

Matrix Spike and Matrix Spike Duplicate

If the limits are not met; verify satisfactory instrument performance; if possible verify that no error was made while weighing the samples portions; review the analytical procedure with the performing personnel and note the finding in the case narrative.

Laboratory Control Standard

In the control limits are not met; recalculate; assess impact on data; document any outliers in the case narrative and re-extract the entire batch of samples if necessary.

Recovery Standard

If outside acceptance criteria investigate and reanalyze if necessary.

Duplicate
If the limits are not met; verify satisfactory instrument performance; verify that no error was made while weighing the sample and reagents; review the analytical procedure with the laboratory personnel; note the findings in the case narrative.

Field Duplicate
The laboratory will not know which sample is the field duplicate; if the limits are exceeding for the field replicate, this will be addressed by the data validator.

Rinsate Blank

Any problems with the Rinsate blanks will be addressed by the data validator.

16.15 QA/QC problems are to be noted in the case narrative and immediately reported to the Malcolm Pirnie representative. If further assistance is required, the Malcolm Pirnie representative should be contacted for instruction Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

17 STATEMENT OF WORK – BUTYLTIN COMPOUNDS

17.1 General description of analytical service requested

Analysis of aqueous and sediment samples for Butyl tin compounds.

17.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD[a]	Sediment/Aqueous	Note: In the absence of standardized methods for analysis of butyl tin compounds, laboratories must develop and provide their own standard operating procedures. The following literature describes methods for analysis of butyl tin compounds: Cedric G. Arnold, et al. *Determination of Organotin Compounds in Water, Sediments, and Sewage Sludge Using Perdeuterated Internal Standards, Accelerated Solvent Extraction, and Large-Volume-Injection GC/MS* Anal. Chem 1988, 70, 3094-3101. Or Uhler, A.D. and W.G. Steinhauer. 1988. *Measurement of butyltin species in water by n-pentyl derivatization with gas chromatography/flame photometric detection (GC/FPD) and gas chromatography with mass spectrometry (GC/MS).* Prepared for the Consortium of Tributytlin Manufacturers.

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

17.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

17.4 Estimated date(s) of sample collection

May 2005 – December 2007.

17.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

17.6 Holding time and number of days to analysis

Samples and extracts should be stored at 4^{o}C. Aqueous samples can be held 7 days to extraction and 40 days after extraction. Sediment samples can be held up to 14 days to extraction and 40 days after extraction.

17.7 Analytical protocol required

In the absence of standardized methods for analysis of butyltin compounds, laboratories must develop their own standard operating procedures. The following literature describes methods for analysis of butyltin compounds:

> Cedric G. Arnold, et al. *Determination of Organotin Compounds in Water, Sediments, and Sewage Sludge Using Perdeuterated Internal Standards, Accelerated Solvent Extraction, and Large-Volume-Injection GC/MS* Anal. Chem 1988, 70, 3094-3101.
> Or
> Uhler, A.D. and W.G. Steinhauer. 1988. *Measurement of butyltin species in water by n-pentyl derivatization with gas chromatography/flame photometric detection (GC/FPD) and gas chromatography with mass spectrometry*

(GC/MS). Prepared for the Consortium of Tributytlin Manufacturers.

17.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.)

The annual calibrations, historical backgrounds, and other relevant quality control data must be included in each data package.

The maximum number of samples in an SDG comprising an analytical batch is twenty (20). A sample receipt checklist (Attachment 1) must be filled out for every sample delivery received by the laboratory. the checklists associated with an SDG must be included in the data package. Any problems with sample check-in must be reported to the Malcolm Pirnie representative immediately. The laboratory shall be required to electronically report sample check-in results daily on a web page developed by Malcolm Pirnie.

17.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory.

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

17.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis the laboratory must supply a detailed example calculation that clearly demonstrates the manner in which the initial and final result was derived. Where applicable, each component of the calculation must be explained.

The laboratory will be required to homogenize sediment samples prior to analysis.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

17.11 Name of sampling/shipping contact

James McCann
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Second Floor
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201-398-4310 (direct)
201-797-7400 (office)
201-797-4399 (fax)
jmccann@pirnie.com

17.12 Data Requirements

Compounds	Reporting Limit (RL) Water (ng/L)	Reporting Limit (RL) (ug/kg) for dry sediment
Monobuyltin	0.01	3
Dibutyltin	0.01	3
Tributyltin	0.005	1
Tetrabutyltin	0.01	3

Notes: The reporting limit should be based upon the low-level calibration point. Specific detection limits are highly matrix dependent. The laboratory-determined method detection limit (MDL) should be below the RL given in this table.

17.13 Quality Control Requirements

AUDITS REQUIRED	FREQUENCY OF AUDITS	LIMITS
Initial calibration (ICAL)	Initially prior to analyzing samples	A five-point curve (minimum) for each compound of interest covering the range of the sample being analyzed. ≤25% Relative Standard Deviation (RSD) $r^2 = 0.995$
Initial Calibration Check	Once with each initial calibration	Percent Difference from ICAL ≤15%
Calibration Verification (Using mid-point QC check)	At the beginning and end of every 12 hours of samples run.	Standards must fall within the absolute retention time windows. Results must be within ± 25% of the response calculated
Internal Standards (IS)	Every sample prior to analysis	Area within 50-200% and retention time within 0.5 min of IS in associated calibration standard.
Method Blanks	With each batch of up to 20 field samples	< RL or analyte concentrations in associated samples > 10 times blank concentrations
Matrix Spike (MS) and Matrix Spike Duplicate (MSD)	With each batch of up to 20 field samples	Percent Recovery (%R): Water: 40-160% Sediment/Tissue: 50 - 150% Relative Percent Difference (RPD) - ≤30% Target spike must be >5 times background concentration to be appropriate for data quality assessment.
Laboratory Control Sample (LCS)	With each analytical batch of up to 20 field samples	%R: 50-150%.
Surrogate Recoveries	With each analysis, before sample extraction, spike each sample with surrogates.	%R: 30-120%
Laboratory Duplicate Samples	With each batch of up to 20 samples	= 30 % RPD or % Diff < RL Analyte concentration must be >5 times MDL to be appropriate for data quality assessment.
Field Duplicate	Per 20 samples	=50% RPD; evaluated for analytes >5 times the MDL.

Rinsate Blank	Not to exceed one Rinsate per day of sampling, but at least one weekly	< RL

Notes:

A sample batch is composed of a maximum of twenty (20) field samples plus associated QC which have all been prepared on the same day.

Laboratory duplicates and method blanks must be carried through the entire preparation and analytical procedures.

At a minimum the laboratory should follow all the performance and QC requirements in 8082A.

17.14 Action required if limits are exceeded

Initial Calibration

The initial calibration requirements must be met before any samples are analyzed. If any continuing calibration does not meet the required criteria, a new initial calibration sequence must be run. The initial calibration sequence must consist of a minimum of five (5) standard concentrations. If the calibration curve does not meet the required limit, standards must be reanalyzed and a new standard curve generated. If a sample concentration is at or exceeds the highest calibration standard, the sample should be diluted and reanalyzed.

Calibration Verification

A mid-point continuing calibration QC check standard must be run at the beginning and end of every 12 hours of sample analysis per instrument. If standards do not fall within the absolute retention windows the GC retention times should be corrected prior to analyzing samples. If control limits are not met, corrective actions must be taken, and a new continuing calibration check sample run. If the control limits are still not met, the analysis must be stopped, the problem corrected, and a new initial calibration sequence must be run. Sample analysis cannot begin until the control limits are met. To validate positive data, the continuing calibration check must also be acceptable at the end of every 12 hour period during which samples are analyzed. Samples must be reanalyzed if the ending continuing calibration check control limits are not met.

Method Blanks

All sample results must be associated with an acceptable method blank which was extracted within the same extraction time, batch, and matrix type as the samples. A method blank is required between a calibration run and the first sample run. The method blank and the samples must be analyzed on the same instrument. If the method blank exceeds the control limits, corrective actions must be taken, including investigating and justifying the reason the control limits were exceeded, reanalyzing the method blank, and/or reprocessing the entire batch; note the findings in the case narrative.

MS/MSD

A matrix spike and matrix spike duplicate (MS/MSD) must be analyzed with each analytical batch of up to 20 samples. The MS fortification solutions are to contain all the unlabeled target analytes at concentrations corresponding to the calibration mid-point. If the quality control limits are not met: verify satisfactory instrument performance; if possible, verify that no error was made while weighing the sample portions; review the analytical procedure with the performing laboratory personnel; note the findings in the case narrative.

LCS

An LCS must be analyzed with each analytical batch of up to 20 samples. The LSC consists of an aliquot of a clean control matrix similar to the sample matrix and of the same weight and volume. The LCS is spiked with the same analytes at the same concentrations as the MS. When the results of the MS indicate a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix. If the QC limits are not met, verify satisfactory instrument performance and review the analytical procedure with the performing laboratory personnel; note the findings in the case narrative.

Surrogate Recovery

With each analysis, before sample extraction, spike each sample with surrogates. Develop statistically determined QC chart limits with recovery limits defined in QC Requirements table (item 3). QC check samples should be re-extracted and re-analyzed if surrogate recovery does not meet control limits.

Duplicate

A laboratory duplicate must be analyzed with each analytical batch of up to 20 samples. Duplicate samples are aliquots of similar mass or volume taken from the same sample container and carried through the entire preparation and analytical procedure. If the QC limits are not met: verify satisfactory instrument performance; if possible, verify that no error was made while weighing the sample portions; review the analytical procedure with the performing laboratory personnel; note the findings in the case narrative.

Field Duplicate
The laboratory will not know which sample is the field duplicate; if the limits are exceeding for the field replicate, this will be addressed by the data validator.

Rinsate Blank

Results of Rinsate blank analyses that exceed recommended limits for analytes of interest will be addressed by the data validator, not the laboratory.

17.15 QA/QC problems are to be noted in the case narrative and immediately reported to the Malcolm Pirnie representative. If further assistance is required, the Malcolm Pirnie representative should be contacted for instruction Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

18 STATEMENT OF WORK – TOTAL PETROLEUM HYDRROCARBONS (TPH)

18.1 General description of analytical service requested

Analyze aqueous and sediment samples for total petroleum hydrocarbons (TPH).

18.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD[a]	Sediment/Aqueous	Measure Total Petroleum Hydrocarbon in the by "Method SW-846-8015B Nonhalogenated Organics Using GC/FID"

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

18.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

18.4 Estimated date(s) of sample collection

May 2005 – December 2007.

18.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

18.6 Holding time and number of days to analysis

Samples and extracts should be stored at 4^{o}C. Samples can be held up to 14 days to extraction and 40 days after extraction.

18.7 Analytical protocol required

Method 8015B Nonhalogenated Organics Using GC/FID

18.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The annual calibrations, historical backgrounds, and other relevant quality control data must be included in each data package.

The maximum number of samples in an SDG comprising an analytical batch is twenty (20). A sample receipt checklist (Attachment 1) must be filled out for every sample delivery received by the laboratory. All of the checklists associated with an SDG must be included in the data package. Any problems with sample check-in must be reported to the Malcolm Pirnie representative immediately. The laboratory shall be required to electronically report sample check-in results daily on a web page developed by Malcolm Pirnie.

18.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory.

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

18.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis the laboratory must supply a detailed example calculation that clearly demonstrates the manner in which the initial and final result was derived. Where applicable, each component of the calculation must be explained.

The laboratory will be required to homogenize sediment samples prior to analysis.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

18.11 Name of sampling/shipping contact

James McCann
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jmccann@pirnie.com

18.12 Data Requirements

Compounds	Reporting Limit (RL) Water	Reporting Limit (RL) Dry sediment
TPH (Should include all the diesel hydrocarbons in at least the C10 to C28 range.)	1 mg/L	20 mg/kg

18.13 Quality Control Requirements

AUDITS REQUIRED	FREQUENCY OF AUDITS	LIMITS
Initial calibration (ICAL)	Prior to analyzing samples	A five-point curve using the external standard techniques described in UPEPA SW-848 8015B using a representative standard such as No. 2 Diesel fuel should be used to calibrate the instrument.
Method Blanks	With each batch of up to 20 field samples	< RL or analyte concentrations in associated samples > 10 times blank concentrations

Matrix Spike (MS) and Matrix Spike Duplicate (MSD)	With each batch of up to 20 field samples	Percent Recovery (%R): 40-140% In water Relative Percent Difference (RPD) - ≤25% In sediment Relative Percent Difference (RPD) - ≤35%
Laboratory Control Sample (LCS)	With each analytical batch of up to 20 field samples	%R: 40-140%.
Surrogate Recoveries	With each analysis, before sample extraction, spike each sample with surrogates .	%R: 40-150%
Laboratory Duplicate Samples	With each batch of up to 20 samples	= 30 % RPD or % Diff < RL Analyte concentration must be >10 times MDL to be appropriate for data quality assessment.
Field Duplicate	With each batch of samples	RPD < 50%; evaluated for analytes >5 times the MDL.

Notes:

A sample batch is composed of a maximum of twenty (20) field samples plus associated QC which have all been prepared on the same day.

Laboratory duplicates and method blanks must be carried through the entire preparation and analytical procedures.

At a minimum the laboratory should follow all the performance and QC requirements in 8082A.

18.14 Action required if limits are exceeded

Initial Calibration

The calibration requirements must be met before any samples are analyzed. The initial calibration sequence must consist of a minimum of five (5) standard concentrations. If a sample concentration is at or exceeds the highest calibration standard, the sample should be diluted and reanalyzed or a new calibration point added above the concentration of the sample.

Method Blanks

All sample results must be associated with an acceptable method blank which was extracted within the same extraction time, batch, and matrix type as the samples. A method blank is required between a calibration run and the first sample run. The method blank and the samples must be analyzed on the same instrument. If the method blank exceeds the control limits, corrective actions must be taken, including investigating and justifying the reason the control limits were exceeded, reanalyzing the method blank, and/or reprocessing the entire batch; note the findings in the case narrative.

MS/MSD

A matrix spike and matrix spike duplicate (MS/MSD) must be analyzed with each analytical batch of up to 20 samples. If the quality control limits are not met: verify satisfactory instrument performance; if possible, verify that no error was made while weighing the sample portions; review the analytical procedure with the performing laboratory personnel; note the findings in the case narrative.

LCS

An LCS must be analyzed with each analytical batch of up to 20 samples. The LSC consists of an aliquot of a clean control matrix similar to the sample matrix and of the same weight and volume. The LCS is spiked with the same analytes at the same

concentrations as the MS. When the results of the MS indicate a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix. If the QC limits are not met, verify satisfactory instrument performance and review the analytical procedure with the performing laboratory personnel; note the findings in the case narrative.

Surrogate Recovery

With each analysis, before sample extraction, spike each sample with surrogates. Develop statistically determined QC chart limits with recovery limits defined in QC Requirements table (item 3). QC check samples should be re-extracted and re-analyzed if surrogate recovery does not meet control limits.

Duplicate

A laboratory duplicate must be analyzed with each analytical batch of up to 20 samples. Duplicate samples are aliquots of similar mass or volume taken from the same sample container and carried through the entire preparation and analytical procedure. If the QC limits are not met: verify satisfactory instrument performance; if possible, verify that no error was made while weighing the sample portions; review the analytical procedure with the performing laboratory personnel; note the findings in the case narrative.

Field Duplicate
The laboratory will not know which sample is the field duplicate; if the limits are exceeding for the field replicate, this will be addressed by the data validator.

18.15 QA/QC problems are to be noted in the case narrative and immediately reported to the Malcolm Pirnie representative. If further assistance is required, the Malcolm Pirnie representative should be contacted for instruction Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

19 STATEMENT OF WORK – CHLORINATED BIPHENYLS CONGENERS

19.1 General description of analytical service requested

Analysis of aqueous and sediment samples for chlorinated biphenyl congeners.

19.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD[a]	Sediment/Aqueous	USEPA Method 1668, Revision A: Chlorinated Biphenyl Congeners in Water , Soil, Sediment, and Tissue by HRGC/HRMS

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

19.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

19.4 Estimated date(s) of sample collection

May 2005 – December 2007.

19.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

19.6 Holding time and number of days to analysis

For aqueous samples adjust pH to 2-3 with sulfuric acid. Store aqueous samples in the dark at 0-4^{o}C for up to one year.

Maintain solid, semi-solid, oily of mixed phase samples at <4^{o}C from time of collection until receipt at the laboratory. Store in the dark at <-10^{o}C for up to one year.

19.7 Analytical protocol required

USEPA Method 1668, Revision A: Chlorinated Biphenyl Congeners in Water, Soil, Sediment, and Tissue by HRGC/HRMS

19.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The annual calibrations, historical backgrounds, and other relevant quality control data must be included in each data package.

The maximum number of samples in an SDG comprising an analytical batch is twenty (20). A sample receipt checklist (Attachment 1) must be filled out for every sample delivery received by the laboratory. All of the checklists associated with an SDG must be included in the data package. Any problems with sample check-in must be reported to the Malcolm Pirnie representative immediately. The laboratory shall be required to electronically report sample check-in results daily on a web page developed by Malcolm Pirnie.

19.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory.

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

19.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis the laboratory must supply a detailed example calculation that clearly demonstrates the manner in which the initial and final result was derived. Where applicable, each component of the calculation must be explained.

The laboratory will be required to homogenize sediment samples prior to analysis.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

19.11 Name of sampling/shipping contact

James McCann
17-17 Route 208 North
Second Floor
Fair Lawn, New Jersey 07410
201-398-4310 (direct)
201-797-7400 (office)
201-797-4399 (fax)
jmccann@pirnie.com

19.12 Data Requirements

PCB Congeners by 1668A	Reporting Limit (RL) Water (pg/L)	Reporting Limits (RL) Sediment-dry weight (ng/kg)
PCB 77	500	50
PCB 81	500	50
PCB 105	200	20
PCB 114	500	50
PCB 118	500	50
PCB 123	500	50
PCB 126	500	50
PCB 156	500	50
PCB 157	500	50
PCB 167	500	50

PCB 169	500	50
PCB 189	500	50
PCB 18	500	50
PCB 28	500	50
PCB 44	500	50
PCB 49	500	50
PCB 52	500	50
PCB 66	500	50
PCB 101	1000	100
PCB 110	1000	100
PCB 87	500	50
PCB 128	500	50
PCB 138	500	50
PCB 153	500	50
PCB 170	500	50
PCB 180	500	50
PCB 183	1000	100
PCB 187	500	50
PCB 195	1000	100
PCB 206	1000	100
PCB 209	500	50
plus the other 209 PCBs	The Target Reporting Limits for the PCB congeners are equal to the estimated method limits (EMLs) listed for "water" in table 2 of 1668A	The Target Reporting Limits for the PCB congeners are equal to the EMLs listed for "other" in table 2 of 1668A

Note: The specific detection limits are highly matrix dependent. The laboratory detection limits should be at least three times less than the reporting limits. Method 1668A can detect all 209 congeners, but only 125-150 can be resolved completely. The remaining congeners are determined as co-eluting combinations of congeners. The PCB toxicity equivalent (PCB_{TEQ}) and the PCB homologue distribution are calculated from the concentrations of the individual congeners.

19.13 Quality Control Requirements

Audits Required	Frequency of Audits	Limits
Initial Precision and Recovery (IPR)	Before analyzing environmental samples and whenever a change is made in the procedure used.	At least four aliquots with diluted labeled compound spiking solution per 1668A, 9.2 and the recovery and RSD criteria in 1668A, Table 6.
Calibration	Prior to analyzing samples	Calibration must follow the requirements given in 1668A, section 10.0.
System performance and calibration verification are verified for all native CB and labeled compounds by calibration verification standard and a diluted combined 209 congener solution	At the beginning of each 12-hour shift	All performance criteria given 1668A, section 15.0 and 7.10 Table 5 must be met before samples, blanks, IPRs, and OPRs are analyzed.
Mass Spectrometer (MS) Resolution	At the beginning and end of each 12 hour shift	Per requirements in 1668A, 15.2. Static resolving power of at least 10,000
Calibration verification (VER)	Beginning and end of every 12 hours of samples run	The theoretical ion abundance ratios for all chlorinated atoms must be within the QC limits in 1668A, Table 8. Peaks for each CB and labeled compound in the VER standard must be present with signal to noise (S/N) of at least 10.
Retention Times (RT) and GC Resolution	At the beginning of each 12-hour shift	Absolute RTs of labeled Toxics/LOC/window defining congeners $\pm$ 15 seconds of RT during calibration. Relative RTs of native CBs and labeled compounds within limits given in Table 2. (see 1668A, 15.4) Must meet resolution and minimum analysis time specifications in 1668A. 6.9.1.1.2 and 6.9.1.1.1.
Ongoing Precision and Recovery (OPR)	Prior to the analysis of samples from the same batch.	Must meet the OPR limits given in 1668A Table 6.
Method Blank	With each sample batch. Analyze immediately before the OPR.	No greater than the minimum detection levels given in 1668A section 9.5.2.
Spike Samples with Labeled Compound (per 1668A, 9.3)	Each sample must be spiked with diluted labeled compound spiking solution.	Spike recoveries must meet the limits given in 1668A, Table 6.
QC Check Sample obtained from and independent source	Analyze at least once a quarter	Most meet the acceptance criteria provided by the supplier of the QC check standard or must be within at least $\pm$ 20% of the certified or known values.
Duplicate	With each batch of up to 20 samples	Must agree to within $\pm$ 20% of the mean (applicable to concentrations 10 times the detection limits)
Field Duplicate	Typically with each batch of samples	For aqueous samples must agree to within $\pm$ 40 % of the mean (applicable to concentrations 10 times the detection limits. For sediment samples must agree to within $\pm$ 50 % of the mean (applicable to concentrations 10 times the detection limits.

Notes:
A sample batch is composed of a maximum of twenty (20) samples which have all been prepared on the same day.

Laboratory duplicates and method blanks must be carried through the entire preparation and analytical procedures.

At a minimum the laboratory should follow the performance and QC requirements in USEPA 1668A.

19.14 Action required if limits are exceeded

Initial Precision and Recovery (IPR)
An IPR is four aliquots of the diluted (Precision and Recovery Standard) PAR standard analyzed to establish the ability to generate acceptable precision and accuracy. An IPR is performed prior to the first time this method is used and any time the method or instrumentation is modified. If the acceptance criteria in not meet, the problem must be solved and the IPR repeated.

Calibration
The calibration requirements must be met before samples are analyzed. The calibration must be repeated if it does not meet acceptance criteria given in 1668A, Section 10.0.

System Performane

All criteria in 1668A must be met before samples are analyzed. Investigate and correct any problems.

Mass Spectrometer Resolution
The mass spectrometer must be adjusted to meet the require resolution criteria.

Calibration Verification
If the control limits are still not met, the analysis must be stopped, the problem corrected, and a new initial calibration check run. Sample analysis cannot begin until the control limits are met.

Retention Times and GC Resolution
Gas chromatographic conditions need to be adjusted until the required retention time criteria and resolution are achieved.

Ongoing Precision and Recovery (IPR)
An OPR is a method blank spiked with known quantities of analytes. The OPR is analyzed exactly like a sample. Its purpose is to assure that the results produced by the laboratory remain within the limits specified in the method for precision and recovery. If the acceptance criteria in not meet, the problem must be solved and the OPR repeated. If sufficient sample is available any samples associated with the unacceptable OPR should be repeated.

Method Blank
If the method blank exceeds the control limits, corrective actions must be taken, a new method blank must be prepared and analyzed, and all the samples associated with the out of control blank should be re-prepared and reanalyzed.

Spike Samples with Labeled Compounds
When results of these spikes indicate atypical method performance for samples, the samples are diluted to bring method performance within acceptable limits.

QC Check Sample (QCS)
A QCS is a sample containing all or a subset of the analytes at known concentrations. The QCS is obtained from a source external to the laboratory or is prepared from a source of standards different from the source of calibration standards. It is used to check laboratory performance with test materials prepared external to the normal preparation process. If the criteria are not met the problem must be investigated and corrected before proceeding with additional environmental sample analysis.

Duplicate
If the limits are not met; verify satisfactory instrument performance; verify that no error was made while weighing the sample and reagents; review the analytical procedure with the laboratory personnel; note the findings in the case narrative.

Field Duplicate
The laboratory will not know which sample is the field duplicate; if the limits are exceeding for the field replicate, this will be addressed by the data validator.

19.15 QA/QC problems are to be noted in the case narrative and immediately reported to the Malcolm Pirnie representative. If further assistance is required, the Malcolm Pirnie representative should be contacted for instruction Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

20 COMPENSATION:

The Laboratory's Total Compensation Authorized under this Task Order, which shall not be exceeded without prior written authorization of Malcolm Pirnie, is: **$**_____

[_____] Laboratory's proposal/quotation is incorporated and attached to this Task Order, except for the Laboratory's terms and conditions, if any.

21 COMPENSATION:

The Laboratory's Total Compensation Authorized under this Task Order, which shall not be exceeded without prior written authorization of Malcolm Pirnie, is: **$**_____

[_____] Laboratory's proposal/quotation is incorporated and attached to this Task Order, except for the Laboratory's terms and conditions, if any.

22 CONTRACT:

The Agreement between Malcolm Pirnie and the Client, dated December 7, 2001, is incorporated by reference and is attached hereto as indicated:

[____] A check here indicates that the entire Contract is incorporated and attached to this Task Order.

[__X_] A check here indicates that certain provisions of the Contract are incorporated and attached to this Task Order.

Malcolm Pirnie and Laboratory shall be mutually bound by the terms of this Subcontract and, to the extent that provisions of Malcolm Pirnie's Contract apply to the work of the Laboratory, Laboratory shall assume toward Malcolm Pirnie all obligations which Malcolm Pirnie, under the Contract, assumes toward the Client. Malcolm Pirnie shall have the benefit of all rights, remedies and redress against the Laboratory, which the Client, under the Contract, has against Malcolm Pirnie. In the event of a conflict between the Contract and this Subcontract, the stricter terms and conditions, shall control.

23 TASK ORDER GENERAL SPECIFICATIONS

General Specifications as described in

Exhibit 1.1 of the Subcontract is hereby incorporated by reference as part of this Task Order.

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit.
The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

The laboratory should also have the capability to perform analysis of tissue samples, since we anticipate the project will also require the analysis of tissue samples in the future.

ISSUED AND AUTHORIZED BY:
MALCOLM PIRNIE, INC.

By: _____

Title: _____

Date: _____

ACCEPTED AND AGREED TO BY:
LABORATORY

By:_____

Title: _____

Date: _____

EXHIBIT 1.1

LABORATORY TASK ORDER
GENERAL SPECIFICATIONS

SECTION 1. SHIPMENT OF SAMPLE BOTTLES AND RECEIPT OF SAMPLES

1.1 **Pre-Sampling Preparation**. The Laboratory, upon receipt and acceptance of a Task Order, shall provide Malcolm Pirnie with sample bottles, sample shipping containers conforming to USDOT requirements, sample packing material, field blanks, trip blanks, analyte-free water, and laboratory distilled water. Sample bottles shall be prepared, cleaned and shipped to Malcolm Pirnie under custody in a manner consistent with USEPA CLP protocols unless otherwise specified in the Task Order. Unless otherwise agreed to in Item No. 3 of the Task Order, shipments must be received by Malcolm Pirnie no later than twenty-four (24) hours before the scheduled sampling event.

1.2 **Sample Delivery.** The Laboratory will accept deliveries of Samples at its premises Monday through Friday (except holidays) between the hours of 8:00 a.m. and 5:00 p.m., local time, unless notified by Malcolm Pirnie within forty-eight (48) hours that a shipment for Saturday delivery or other special shipments will be made. Deliveries of Samples will be deemed accepted by the Laboratory unless the Laboratory notifies Malcolm Pirnie in writing that the identification, labeling and content of the Samples do not correspond to the description of the Samples on the Task Order and the Chain of Custody. Samples delivery date (Receipt Date) to the Premises will be logged by the Laboratory.

1.3 **Sample Receipt Reports.** Upon request, the Laboratory shall contact Malcolm Pirnie each day a Sample or Samples are received detailing the date of receipt, the number of Samples received, the condition of the containers and contents, the parameters to be analyzed, anticipated analytical turnaround time, and the Laboratory's assigned Sample numbers.

1.4 **Chain-of-Custody Documentation.** Chain-of-Custody documentation shall be initiated at the Laboratory with the release of the Sample bottles from the Laboratory's preparation group for transport to Malcolm Pirnie. The field chain-of-custody documents, returning with the Samples after collection, shall terminate with the Laboratory's signature acknowledging receipt of the Samples from Malcolm Pirnie.

1.5 **Sample Inspection.** If, upon receipt by the Laboratory of a delivered Sample, the Laboratory in its reasonable judgment determines that, due to the nature of the composition of the Sample or otherwise, the tests or analyses specified or requested for such Samples by Malcolm Pirnie (on the Task Order or otherwise) are not practicable, are likely not to produce the desired results, or will require modification of the Laboratory's standard procedure, the Laboratory shall promptly notify Malcolm Pirnie of such determination. If, in the Laboratory's reasonable judgment, modified or different tests or analyses represent reasonably practicable alternatives to those originally specified or requested by Malcolm Pirnie, the Laboratory will quote a unit rate for such modified or different tests or analyses. Upon written affirmation by Malcolm Pirnie of its acceptance of such modified or different tests and analyses and the Laboratory's quoted unit rates therefore, the Task Order shall be deemed to be amended to reflect such modified or different tests and analyses (and related unit rates therefore) and the Laboratory will commence the processing of such Sample. The Receipt Date for any such Sample shall be the date on which Malcolm Pirnie affirms its acceptance of such modified or different tests and analyses.

1.6 **Sample Volume.** Malcolm Pirnie shall have sole responsibility to provide and deliver to the Laboratory the volume of samples specified or requested by the Laboratory. If the volume of any Samples received by the Laboratory is less than that so specified or requested, the Laboratory shall immediately notify Malcolm Pirnie of such and then may proceed to accept such Sample and commence testing and analysis of such Sample according the Laboratory's standard procedures or such other modified or different procedures as are, in

the Laboratory's judgment, necessary or appropriate in light of the volume of such Sample received unless specifically requested not to do so by Malcolm Pirnie. The Laboratory shall have no liability or responsibility of any kind whatsoever arising out of or in connection with: the delivery by Malcolm Pirnie of insufficient volume of any Sample; for using modified or different procedures to test or analyze insufficient volumes of such Sample; for the inability to use the Laboratory's standard procedures for the testing or analysis of such Sample; or any inability to use the Laboratory's standard Quality Assurance procedures for or in connection with such Sample.

1.7 **Risk of Loss.** Prior to the receipt by the Laboratory or its agent(s) of any samples, the entire risk of loss or of damage to such Sample shall remain with Malcolm Pirnie. In no event will the Laboratory have any responsibility or liability for the action or inaction of any handling, shipment or delivery of Samples and/or shipping containers by Malcolm Pirnie to the Laboratory.

SECTION 2. DELIVERY OF SERVICES

2.1 **Analytical Methodologies.** The Laboratory will perform the services ordered by Malcolm Pirnie using analytical methodologies which are in conformity with methodologies prescribed by the Task Order. In cases where such methodologies have not been so prescribed or described, the Laboratory shall use methodologies generally recognized by USEPA, or other commercial laboratories in the trade as suitable for the services ordered. The Laboratory reserves the right to deviate from these methodologies not prescribed or described by USEPA if necessary or appropriate due to the nature or composition of the Sample to be tested or otherwise in the reasonable judgment of the Laboratory; any such deviations shall be made under the direction and approval of the Laboratory's Quality Assurance Officer. Malcolm Pirnie shall be notified of any deviations prior to commencing the analyses.

2.2 **Analytical Holding Times.** The Laboratory will comply with storage, processing and analytical holding time limits set forth in applicable regulations specifying analytical methods or in regulatory agency guidelines, such as USEPA CLP Guidelines or state equivalents, or otherwise reasonably requested by Malcolm Pirnie and quoted on the Task Order. For purposes of determining compliance with any such holding time limits, the Laboratory will assume that all Samples have been collected by Malcolm Pirnie no more than twenty-four (24) hours prior to the Laboratory's receipt of such Samples as provided in Section 4 of the Laboratory Task Order.

2.3 **Analytical Turnaround Time.** The Laboratory will comply with all other duly authorized and quoted service conditions. Analytical turnaround time (which means, the time from the Laboratory's acceptance of a Sample as provided in Section 1.2 of this Exhibit 1.1 to the release to Malcolm Pirnie of a written report of the results of its tests and services provided hereunder with respect to such Sample as provided in Section 2.6 of this Exhibit) shall be guaranteed to be **thirty (30) calendar days** unless specified in writing or in the Task Order.

2.4 **Expedited Service for Analytical Turnaround Time.** Upon the request of Malcolm Pirnie and subject to the approval of the Laboratory, the Laboratory may agree to perform services for Malcolm Pirnie on an expedited basis. If Malcolm Pirnie and Laboratory agree, to the extent set forth in the Task Order, the Laboratory may invoice an analytical turnaround time premium or surcharge for expedited services provided to Malcolm Pirnie. Unless agreed to by Malcolm Pirnie on an individual Task Order, the Laboratory's maximum premium or surcharge allowed are as follows:

15 to 29 day turnaround not more than	10% premium
8 to 14 day turnaround not more than	20% premium
2 to 7 day turnaround not more than	50% premium
one (1) day turnaround not more than	100% premium

In the event that expedited services cannot be performed as agreed by the Laboratory and results thereof provided in writing by the specified date, the Laboratory will, subject to the provisions of Section 2.7 of this Exhibit 1.1, provide complete verbal results by telephone to Malcolm Pirnie on such specified date in satisfaction of its response obligations under this Section. Written results will follow within five days. Premiums or surcharges for expedited services shall be reduced by ten (10) percent charged for each day after the specified due date that the written results of such expedited services are not received by Malcolm Pirnie.

2.5 **Delivery of Analytical Results.** The analytical turnaround time for delivery of Analytical Results shall be measured from the Receipt Date to the delivery date. The delivery date shall be considered to be the date of receipt by Malcolm Pirnie if sent by mail, courier, or express delivery service, or the date/time group if electronically transmitted. Late delivery of written reports of analytical results, under 2.3 or 2.4 above, beyond the thirty (30) calendar day guarantee delivery may subject the Laboratory to liquidated damages as described under Section 5 of this Subcontract.

2.6 **Reporting of Analytical Results.** The Laboratory will prepare and deliver to Malcolm Pirnie a written report of the results of the Laboratory's services with respect to a Sample upon completion of all services ordered by Malcolm Pirnie with respect to that Sample. Malcolm Pirnie may designate, in the Task Order, the format and content of such report in accordance with one of the Laboratory's standard

report formats as modified by Malcolm Pirnie. Unless otherwise requested on the Task Order, data shall be reported in the appropriate metric units or as stated in the Task Order referenced methodology. Solid/ sediment samples shall be reported on a "dry weight" basis. Individual reporting limits shall be included for each analysis parameter.

2.7 **Reruns or Regeneration.**

2.7.1 When, in the reasonable judgment of the Laboratory's Quality Assurance Department, it is necessary or appropriate, and feasible, to rerun any tests or procedures or to regenerate data or test results derived from any Sample or any services performed by the Laboratory hereunder, the Laboratory may make such efforts to accomplish such rerun or regeneration as it deems reasonably necessary, including without limitation re-preparation or re-analysis of a Sample. The decision as to which Samples and services, if any, require (and permit) such rerunning or regeneration shall be within the sole discretion of the Laboratory's Quality Assurance Officer.

2.7.2 No consideration will be given to the sources, Receipt Dates or timing of Samples or services performed in determining which, if any, of such Samples or services require rerunning or regeneration. Sample reruns will be accepted as justification for exceeding delivery dates if the Laboratory's Quality Assurance Officer determines that the nature of the Samples or analysis protocol necessitates this delay and immediately notified Malcolm Pirnie of such. The Laboratory's Quality Assurance Officer shall then confirm in writing within five (5) days for what reasons the nature of the Sample or analysis protocol necessitated a delay.

2.7.3 Sample reruns will not be accepted as justification for exceeding delivery dates if it is determined by Malcolm Pirnie that error or negligence by the Laboratory necessitated such reanalysis. The expense of such reruns discussed in this Section 2.7 shall be borne by the Laboratory.

SECTION 3. STORAGE AND DISPOSAL OF SAMPLES

3.1 **Reasonable Storage Period.** The Laboratory will maintain in a reasonable storage facility material which is part of or related to a Sample, after delivery to Malcolm Pirnie of the Laboratory's final written report with respect to such Sample, for the periods indicated below unless otherwise directed by Malcolm Pirnie.

Material	Storage Periods
Aliquots, portions or residual quantities of the original Sample.	60 days
Extracts of concentrates from original Sample.	180 days
Hardcopy data or test results	The longer of 1 year or the period specified in the Contract.
Magnetic data or test results	The longer of 3 years or the period specified in the Contract.

3.2 **Extended Storage.** In the event that Malcolm Pirnie shall require the Laboratory to store Samples and related information for a period longer than the period specified in Section 3.1 of this Exhibit 1.1, Malcolm Pirnie shall notify Laboratory in writing of the increased Storage Period two weeks prior to the expiration of the Storage Periods set forth above. If authorized to store samples for such longer periods, the Laboratory and Malcolm Pirnie shall negotiate an equitable adjustment to Laboratory's compensation.

SECTION 4. INSPECTION OF LABORATORY RECORDS AND FACILITIES

4.1 **Inspection.** Malcolm Pirnie and/or the Client may inspect the Laboratory's facilities at its Premises during normal business hours. Malcolm Pirnie and/or the Client may review data (if any) prepared by the Laboratory for Quality Assurance purposes which were produced using Malcolm Pirnie's Samples or are directly related thereto or the Laboratory's services hereunder, such as spikes, surrogates, duplicates and blanks.

4.2 **Notice of Inspection.** Malcolm Pirnie and/or the Client shall give the Laboratory notice of any request for an inspection of the Premises pursuant to Section 4.1 of this Exhibit 1.1 or review of Quality Assurance data pursuant to Section 5.2 of this Exhibit 1.1 at least three (3) business days in advance of the desired date of such inspection or review. In all cases, the actual inspection or data review will be limited to the purposes or objectives specified in Malcolm Pirnie's notice.

SECTION 5. DATA CONFORMANCE

5.1 **Conformance.** Prior to delivery of analytical results to Malcolm Pirnie, a senior Laboratory manager will review all data including Quality Assurance/Quality Control results to determine conformance with the requirements of the applicable analytical methodology and this Section. Adequate written documentation of this review, signed by the Laboratory's management representative will accompany analytical results submitted to Malcolm Pirnie.

5.2 **Conformance Documentation.** Written documentation shall include accurate and complete explanations for the following occurrences:

5.2.1 Detection limits or minimum quantification limits elevated above those required by the USEPA CLP program (or other requirements consistent with methodologies specified in the Task Order).

5.2.2 Contamination of blanks in excess of USEPA CLP requirements (or other requirements consistent with methodologies specified in the Task Order).

5.2.3 Failure of surrogate and/or spike recovery results to meet acceptance criteria specified in the USEPA CLP Statement of Work (or other criteria consistent with methodologies specified in the Task Order).

5.2.4 Failure of matrix spike and matrix spike duplicate analyses to meet acceptable criteria for percent recovery and relative percent difference (RPD) as specified in the USEPA CLP Statement of Work (or other criteria consistent with methodologies specified in the Task Order).

5.3 **Conformance Standard.** The Laboratory shall perform a statistical analysis to determine the mean analytical results or performance of Malcolm Pirnie's quality assurance (QA) analyses. The Laboratory shall validate that the percentage of QA analyses that, within acceptable ranges, does not exceed acceptable standards specified in the USEPA CLP Statement of Work (or other acceptable standards consistent with the methodologies specified in the Task Order).

5.4 **Conformance Report.** The Laboratory's Director of Quality Assurance shall confirm in writing that analytical data submitted to Malcolm Pirnie has been reviewed and is acceptable based on his review and evaluation of QA analyses appropriate for the methodology used and as described in this Section.

SECTION 6. INDEPENDENT VALIDATION

6.1 **Independent Validation.** The analytical data may be subject to validation by Malcolm Pirnie or by an independent validator, including, but not limited to the USEPA and other regulatory agencies, to evaluate the quality and useability of the data for Malcolm Pirnie's intended purpose. The procedures to validate such data shall be determined by Malcolm Pirnie or the independent validator, including, but not limited to the use of EPA CLP validation procedures.

SECTION 7. CURE AND REPERFORMANCE

7.1 **Cure of Data Package.** The Laboratory may be required to cure analytical data packages that are unusable or of limited or qualified use, as determined during an independent validation under Section 6, in accordance with appropriate procedures or guidelines used by USEPA or State agencies. If the data remain unusable or its use limited or qualified, the Laboratory may be required to reimburse Malcolm Pirnie for all damages, costs or expenses as specified elsewhere in this Subcontract and in Section 7.2 below.

7.2 **Reperformance.** The Laboratory's obligation to repeat any services with respect to any Sample shall be contingent on Malcolm Pirnie's providing, at the request of the Laboratory, an additional Sample or Samples. If repeat analysis is required due to the sample(s) being lost, destroyed or made useless due to the Laboratory's negligence or failure to act, including without limitation, exceeded holding times, reasonable costs incurred by Malcolm Pirnie, the Client, their agents or subcontractors, including without limitation, costs of remobilizing in the field (i.e., drilling or excavation), resampling, reanalyses and all ancillary and incidental administrative and management costs and expenses shall be reimbursed by Laboratory within five (5) calendar days of demand by Malcolm Pirnie.

ATTACHMENT 3.2 – DRAFT

TASK ORDER NO. 1

[X] ORIGINAL

[_____] AMENDMENT [Date of Original_____]

Subject to the Subcontract between *Malcolm Pirnie, Inc.* [**Malcolm Pirnie**] and _____. [**Laboratory**], dated _____, 2005, Malcolm Pirnie hereby authorizes Laboratory to perform services as specified in this Task Order and in accordance with the above mentioned Subcontract.

1.0 PROJECT INFORMATION

Project Name:	Lower Passaic River Restoration Project
Client:	US Army Corps of Engineer - Kansas City District
Malcolm Pirnie Project Number:	4553-001
Subcontract Number:	KC-ACE2002-035
Statements of Work:	Total Dissolved Solids Total Suspended Solids Volatile Suspended Solids Chemical Oxygen Demand (COD) Biological Oxygen Demand Chlorophyll a pH Radon Radionuclides: Beryllium-7, Cesium-137, Radium-226, Lead-210 and Thorium-234 Cation Exchange Capacity % Moisture Grain Size Density (Specific Gravity) Shear Stress Atterberg Limits
Malcolm Pirnie Representative:	James McCann
Malcolm Pirnie Office Address:	17-17 Route 208 North Second Floor Fair Lawn, New Jersey 07410 201-398-4310 Direct 201-797-7400 Office 201-797-4399 FAX jmccann@pirnie.com
Laboratory Representative:	_____
Laboratory Project No.	_____

This Task Order consists of the following Statements of Work (SOWs) for the various analytical services requested from the Laboratory:

2 STATEMENT OF WORK – TOTAL DISSOLVED SOLIDS (TDS)

2.1 General description of analytical service requested

Analysis of aqueous samples for TDS.

2.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Concentration	Analysis
TBD [a]	Aqueous	Medium	USEPA Method 160.1

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

2.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

2.4 Estimated date(s) of sample collection

May 2005 – December 2007.

2.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

2.6 Holding time and number of days to analysis

Preservation of sample is not practical; analysis should begin as soon as possible (holding time should not exceed seven days). Refrigeration or icing to 4°C to minimize microbiological decomposition of solids is recommended (see EPA Method 160.1, Part 4).

2.7 Analytical protocol required

Matrix	Analysis
Aqueous	USEPA Method 160.1 Method for Chemical Analysis of Water and Wastes, EPA600/4/79/020

2.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to USEPA Method 160.1 protocols.

If the pH of the sample is < 4 , raise the pH of the aliquot (using NaOH titrant) to a value between 4-8 and subtract the weight of NaOH added from the weight of the residue.

Residues must be weighed to constant weight pursuant to 160.1. Constant weight is defined as a) less than 0.5 mg or less than 4% weight loss from the previous weight, whichever is smaller, or b) dried overnight (12 hours drying time) with a single weight used for calculations.

2.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request, and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory).

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of samples is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

2.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

2.11 Name of sampling/shipping contact

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2.12 Data Requirements

The reporting limit for TDS is 1 mg/L (see USEPA Method 160.1, Part 1).

2.13 Quality Control Requirements

The following audits are required where applicable.

Audit Requires	Frequency of Audit	Limit
Method Blank	1 per sample batch [a]	Detection limit
Matrix Duplicate [b]	1 per sample batch	RPD 25 % or Diff detection limit

[a] A sample batch is composed of a maximum of twenty samples, which have all been prepared on the same day
[b] Matrix duplicates must be carried through the entire preparation and analytical procedure.

2.14 Action required if limits are exceeded

Method Blank
The method blank must follow the exact analytical procedure as the field samples. All positive sample results must be associated with an acceptable blank. If the method blank exceeds the control limit, the instrument should be recalibrated and the method blank re-prepared and re-analyzed. The blank acceptance criteria must be met prior to sample analysis.

Matrix Duplicate
Duplicate sample analyses, which exceed the control limits, must be reported in the case narrative.

2.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case

[ ] Expedited – specify _____ days or by _____ date

3 STATEMENT OF WORK – SUSPENDED SEDIMENT

3.1 General description of analytical service requested

Analysis of aqueous samples for suspended sediment.

3.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Concentration	Analysis
TBD [a]	Aqueous	Medium	USEPA Method 160.2

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

3.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

3.4 Estimated date(s) of sample collection

May 2005 – December 2007

3.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

3.6 Holding time and number of days to analysis

Preservation of sample is not practical; analysis should begin as soon as possible (holding time should not exceed seven days). Refrigeration or icing to 4°C to minimize microbiological decomposition of solids is recommended (see EPA Method 160.2, Part 4).

3.7 Analytical protocol required

Matrix	Analysis
Aqueous	USEPA Method 160.2 Method for Chemical Analysis of Water and Wastes, EPA600/4/79/020

3.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to all USEPA Method 160.2 protocols.

The laboratory must use an aliquot size of at least 250 mL for analysis.

Residues must be weighed to constant weight pursuant to 160.2. Constant weight is defined as a) less than 0.5 mg or less than 4% weight loss from the previous weight, whichever is smaller, or b) dried overnight (12 hours drying time) with a single weight used for calculations.

3.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request, and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory).

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of samples is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

3.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

3.11 Name of sampling/shipping contact

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3.12 Data Requirements

The reporting limit is 1 mg/L (see USEPA Method 160.2, Part 1).

3.13 Quality Control Requirements

The following audits are required where applicable.

Audit Requires	Frequency of Audit	Limit
Method Blank	1 per sample batch [a]	Detection limit
Matrix Duplicate [b]	1 per sample batch	RPD 25 % or Diff detection limit

[a] A sample batch is composed of a maximum of twenty samples, which have all been prepared on the same day
[b] Laboratory duplicates must be carried through the entire preparation and analytical procedure.

3.14 Action required if limits are exceeded

Method Blank
The method blank must follow the exact analytical procedure as the field samples. All positive sample results must be associated with an acceptable blank. If the method blank exceeds the control limit, the instrument should be recalibrated and the method blank re-prepared and re-analyzed. The blank acceptance criteria must be met prior to sample analysis.

Matrix Duplicate
Duplicate sample analyses, which exceed the control limits, must be reported in the case narrative.

3.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

4 STATEMENT OF WORK – VOLATILE SUSPENDED SOLIDS (VSS)

4.1 General description of analytical service requested

Analysis of aqueous samples for VSS.

4.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Concentration	Analysis
TBD [a]	Aqueous	Medium	USEPA Method 160.4

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

4.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

4.4 Estimated date(s) of sample collection

May 2005 – December 2007.

4.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

4.6 Holding time and number of days to analysis

Preservation of sample is not practical; analysis should begin as soon as possible (holding time should not exceed seven days). Refrigeration or icing to 4°C to minimize microbiological decomposition of solids is recommended (see EPA Method 160.4, Part 4).

4.7 Analytical protocol required

Matrix	Analysis
Aqueous	USEPA Method 160.4 Method for Chemical Analysis of Water and Wastes, EPA600/4/79/020

4.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to all USEPA Method 160.4 protocols.

4.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request, and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory).

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of samples is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

4.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

4.11 Name of sampling/shipping contact

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4.12Data Requirements

Reporting limit for VSS is 1.0 mg/L.

4.13 Quality Control Requirements

The following audits are required where applicable.

Audit Requires	Frequency of Audit	Limit
Preparation Blank	1 per sample batch [a]	Detection limit
Laboratory Duplicate [b]	1 per sample batch	RPD 20 % or Diff detection limit

[a] A sample batch is composed of a maximum of twenty samples, which have all been prepared on the same day
[b] Laboratory duplicates must be carried through the entire preparation and analytical procedure.

4.14 Action required if limits are exceeded

Preparation Blank
The preparation blank must follow the exact analytical procedure as the field samples. All positive sample results must be associated with an acceptable blank. If the preparation blank exceeds the control limit, the instrument should be recalibrated and the preparation blank re-prepared and re-analyzed. The blank acceptance criteria must be met prior to sample analysis.

Laboratory Duplicate
Duplicate sample analyses, which exceed the control limits, must be reported in the case narrative.

4.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

5 STATEMENT OF WORK – CHLOROPHYLL a

5.1 General description of analytical service requested

Analysis of aqueous samples for Chlorophyll a.

5.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Aqueous	EPA Method 445.0 In Vitro Determination of Chlorophyll a and Pheophtytin a in Marine and Freshwater Algae by Fluorescence, Revision 1.2 September 1997

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

5.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

5.4 Estimated date(s) of sample collection

May 2005 – December 2007.

5.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

5.6 Holding time and number of days to analysis

Filter samples in subdued light as soon as possible after sampling. Sampled filters should be stored (-20^{o}C or -70^{o}C in the dark until extraction. Filters can be stored frozen at -20 or -70^{o}C for as long as 31/2 weeks without significant loss of chlorophyll a.

5.7 Analytical protocol required

EPA Method 445.0 In Vitro Determination of Chlorophyll a and Pheophtytin a in Marine and Freshwater Algae by Fluorescence, Revision 1.2 September 1997

5.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to all USEPA EPA 445.0 protocols and requirements.

5.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request, and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory).

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a

shipment of samples is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

5.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

5.11 Name of sampling/shipping contact

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5.12 Data Requirements

Matrix	Parameters	Reporting Limit (RL)
Aqueous	Chlorophyll a (Chl a)	0.11 *u*g/l

5.13 Quality Control Requirements

The following audits are required where applicable.

Frequency of Audits	Audit required	Limits
With each batch of samples of the same matrix	LRB	= IDL
With each batch of samples	QCS	$\pm$ 5 of the expected values
With each batch of samples	Duplicate	RPD = 20% evaluated for analytes >5 times the MDL.

Notes:
A sample batch is composed of a maximum of twenty (20) samples which have all been prepared on the same day.

Laboratory duplicates must be carried through the entire preparation and analytical procedures.

The lab must follow all the performance and QC requirements in Method 445.0.

5.14 Action required if limits are exceeded

Laboratory Reagent Blank

The lab must analyze at least one blank filter with each sample batch. The LBR should be the last filter extracted. LBR data are used to assess contamination from the laboratory environment. LBR values that exceed the IDL indicate contamination from the laboratory environment. When LRB values contribute 10% of more of the analyte level determined for a sample, fresh samples or field duplicates must be analyzed after the contamination has been corrected and acceptable LRB values have been obtained.

Quality Control Standard (QCS)

Accuracy can only be assessed by analyzing check standards as samples and QCS. Since there are no commercially available QCSs, dilution of a stock standard of a different lot number from that used for preparation of the calibration solutions may be used. Analysis of the QCS must be within ±5% of the expected value. If outside limits the problem should be investigated and corrected before results are reported.

Duplicate

Duplicate analyses which exceed the control limits must be reported in the case narrative.

5.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

6 STATEMENT OF WORK – CHEMICAL OXYGEN DEMAND (COD)

6.1 General description of analytical service requested

Analysis of aqueous samples for chemical oxygen demand.

6.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Aqueous	USEPA Method 410.3, COD Chemical Oxygen Demand

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

6.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

6.4 Estimated date(s) of sample collection

May 2005 – December 2007.

6.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

6.6 Holding time and number of days to analysis

Samples should be preserved with sulfuric acid to a pH <2 and maintained at 4^{o}C until analysis. Holding time is 28 days.

6.7 Analytical protocol required

USEPA Method 410.3, COD Chemical Oxygen Demand

6.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to all USEPA EPA 410.3 protocols and requirements.

6.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request, and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory).

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of samples is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

6.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

6.11 Name of sampling/shipping contact

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6.12 Data Requirements

Matrix	Analysis	Reporting Limit
Aqueous	Chemical Oxygen Demand	250 mg/L

6.13 Quality Control Requirements

The following audits are required where applicable.

Audits Required	Frequency of Audits	Limits
Initial Calibration Check	Daily, prior to sample analysis	Within ± 10% of the expected values
Duplicate	1 per batch of samples	RPD = 25%; evaluated for analytes >5 times the MDL.
On-going calibration verification using QCS	1 per batch of samples	Within ± 10% of the expected values

Notes:
A sample batch is composed of a maximum of twenty (20) samples which have all been prepared on the same day.

Laboratory duplicates must be carried through the entire preparation and analytical procedures.

6.14 Action required if limits are exceeded

Initial Calibration Check

Prior to analyzing samples, check calibrations by analyzing a Quality Control Standard (QCS). Sample analysis should not be reported until the control limit is met. If outside limits, re-calibrate instrument and repeat QCS.

Duplicate

Duplicate sample analyses which exceed the control limits must be reported in the case narrative.

On-Going Calibration Verification

If the QCS control limits are not met, the analysis must be stopped and the problem corrected. The meter should be re-calibrated and all the samples since the last compliant QCS will be reanalyzed.

6.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

7 STATEMENT OF WORK – BIOLOGICAL OXYGEN DEMAND (BOD)

7.1 General description of analytical service requested

Analysis of aqueous samples for biological oxygen demand.

7.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Aqueous	USEPA Method 4O5.1, BOD Biological Oxygen Demand

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

7.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

7.4 Estimated date(s) of sample collection

May 2005 – December 2007.

7.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

7.6 Holding time and number of days to analysis

Samples should be preserved with sulfuric acid to a pH <2 and maintained at 4^{o}C until analysis. Holding time is 28 days.

7.7 Analytical protocol required

USEPA Method 4O5.1, BOD Biological Oxygen Demand

7.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to all USEPA EPA 405.1 protocols and requirements.

7.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request, and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory).

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of samples is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

7.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

7.11 Name of sampling/shipping contact

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7.12 Data Requirements

Matrix	Analysis	Reporting Limit (RL)
Aqueous	Biological Oxygen Demand	1 mg/L

7.13 Quality Control Requirements

The following audits are required where applicable.

Audits Required	Frequency of Audits	Limits
Lab Duplicate	1 per batch of samples	RPD = 25%; evaluated for analytes >5 times the MDL.
Field Duplicate	1 per batch of samples	RPD = 50%; evaluated for analytes >5 times the MDL.

Notes:
A sample batch is composed of a maximum of twenty (20) field samples plus associated QC which have all been prepared on the same day.

Laboratory duplicates must be carried through the entire preparation and analytical procedures.

7.14 Action required if limits are exceeded

Lab Duplicate

Duplicate analyses which exceed the control limits must be reported in the case narrative.

Field Duplicate

The laboratory will not know which sample is the field duplicate; if the limits are exceeding for the field replicate, this will be addressed by the data validator.

7.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

8 STATEMENT OF WORK – CORROSIVITY (pH)

8.1 General description of analytical service requested

Analysis of sediment and aqueous samples for pH.

8.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Sediment and Pore Water	USEPA SW-846-9045C, Test Methods for Evaluating Solid Waste, Vol. 1C, Laboratory Manual, Physical/Chemical Methods, SW-846.

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

8.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

8.4 Estimated date(s) of sample collection

May 2005 – December 2007.

8.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

8.6 Holding time and number of days to analysis

Samples should be at 4^{o}C and analyzed as soon as possible. Holding time is 24 hours.

8.7 Analytical protocol required

Matrix	Parameter	Analytical Methodology
Sediment and Pore Water	pH	USEPA SW-846-9045C, Test Methods for Evaluating Solid Waste, Vol. 1C, Laboratory Manual, Physical/Chemical Methods, SW-846.

8.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to all USEPA EPA 9045C protocols and requirements.

8.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request, and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory).

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The

laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of samples is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

8.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

8.11 Name of sampling/shipping contact

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8.12 Data Requirements

Analysis	Reporting Limit (RL)
pH	All ranges

8.13 Quality Control Requirements

The following audits are required where applicable.

Audits Required	Frequency of Audits	Limits
Instrument Calibration	Daily, prior to sample analysis	± 0.05 pH units
Lab Duplicate	1 per 10 samples	RPD ≤ 25%
Mid-range check standard	1 per 10 samples	± 0.05 pH units

Notes:

A sample batch is composed of a maximum of twenty (20) samples which have all been prepared on the same day.

Laboratory duplicates must be carried through the entire preparation and analytical procedures.

8.14 Action required if limits are exceeded

Instrument Calibration

Each instrument/electrode must be calibrated daily with each set of samples analyzed. The initial calibration sequence must consist of a minimum of two (2) standards which bracket the expected pH of the samples and are approximately three or more pH units apart. Sample analysis cannot begin until the control limit is met.

If a sample pH is at or exceeds the highest calibration standard, or is at or below the lowest calibration standard, the laboratory must recalibrate the instrument using two points which bracket the pH of the sample.

Lab Duplicate

Duplicate analyses which exceed the control limits must be reported in the case narrative.

Mid-Range Check Standard

If the mid-range check standard control limits are not met, the analysis must be stopped and the problem corrected. The calibration should be verified and the instrument re-calibrated if necessary. After the problem is corrected all the samples since the last compliant mid-range check standard will be reanalyzed.

8.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

9 STATEMENT OF WORK – RADON

9.1 General description of analytical service requested

Analysis of aqueous samples for Radon.

9.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Aqueous	Radon by Standard Method 7500-Rn B Liquid Scintillation Method

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

9.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

9.4 Estimated date(s) of sample collection

May 2005 – December 2007.

9.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

9.6 Holding time and number of days to analysis

Samples stored with no air bubbles and shipped in an insulated package to avoid large temperature changes. Maximum holding time is 4 days.

9.7 Analytical protocol required

Matrix	Parameter	Analytical Methodology
Water	Radon	Standard Method 7500-Rn B Liquid Scintillation Method

9.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to all Standard Method 7500-Rn B protocols and requirements.

9.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory.

An Electronic Data Deliverable (EDD) must be submitted for all of the data. The EDD format has to follow the format in the example EDD in the attached (CD). If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a

shipment of is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

9.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

9.11 Name of sampling/shipping contact

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jmccann@pirnie.com

9.12 Data Requirements

Matrix	Parameter	Reporting
Aqueous	Radon	50 pCi/L

9.13 Quality Control Requirements

The following audits are required where applicable.

Audit required	Frequency of Audits	Limits
Calibration Factor and Background	Prior to testing samples. Minimum of two backgrounds per batch of samples.	Calibration factor should be at least 6 cpm/pCi with a background not exceeding 6 cpm
Field Duplicate	At least every 10 samples or for each batch of samples, which every is greater	RDP less than or equal to the percent 2 sigma counting error or 10% of the decay-corrected radon concentration, whichever is greater.
Quality Control Check Standard (QCCS)	Immediately after the first background and before the first sample. Also after every tenth sample in batch, and a final QCCS as the last sample of the batch.	RDP between sequential pairs of QCCS samples must be less than or equal to the 2 sigma counting error or 10 % of the known value of the QCCS, whichever is greater.

Notes:

A sample batch is composed of a maximum of twenty (20) samples which have all been prepared on the same day.

Laboratory duplicates must be carried through the entire preparation and analytical procedures.

9.14 Action required if limits are exceeded

Calibration Factor and Background

The method is calibrated using standards prepared using radium-226. A least three sets of standards and backgrounds are prepared using distilled of deionizer water. From the pooled results a pooled calibration factor is calculated. The calibration factor should be at least 6 cpm/pCi with a background not exceeding 6 cpm. If these criteria are not meet the problem should be investigated and must be corrected before analyzing samples.

Field Duplicate

The RPD should be less than or equal to the percent 2 sigma counting error or 10% of the decay-corrected radon concentration, whichever is greater. If the RDP exceeds these limits, the problem needs to be investigated and corrective action taken. The problem should be documented and additional field duplicates should be taken.

The laboratory may not know which sample is the field duplicate; if the limits are exceeding for the field replicate, this will be addressed by the data validator.

Quality Control Check Standard (QCCS)

QCCSs are prepared forma dilution of radium different from that used to prepare standards and should have a nominal activity of approximately 8000 pCi/L. Place a QCCS immediately after the first background and before the first sample. Also analyze a QCSS after every tenth sample in batch, and a final QCCS as the last sample of the batch. The RDP between sequential pairs of QCCS samples must be less than or equal to the 2 sigma counting error or 10 % of the known value of the QCCS, whichever is greater. If the RDP exceeds the value, recount the pair of QCCS samples. If the RDP is still unacceptable, standards and or instrument are suspected. The problem must be resolved and samples analyzed between suspect QCCs must be reanalyzed.

9.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

10 STATEMENT OF WORK – RADIOLOGICAL PARAMETERS

10.1 General description of analytical service requested

The required tests include the analysis of aqueous samples for Be-7 and Th-234 and the analysis of sediment samples for Be-7, Cs-137, Rn-226 and Pb-210.

10.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Concentration	Parameter	Analysis
TBD [a]	Sediment	Low	Be-7, Cs137 and Rn-226	Gamma Spectroscopy - Germanium Detector
TBD [a]	Sediment	Low	Pb-210	Gamma Spectroscopy - Germanium Detector
TBD [a]	Filtrate (particles filtered from surface water)	Low	Be-7 and Th-234	Gamma Spectroscopy - Germanium Detector

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

10.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

10.4 Estimated date(s) of sample collection

May 2005 – December 2007.

10.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

10.6 Holding time and number of days to analysis

The samples for Th-234 and Be-7 analysis should not be held for more than one month. Although there are no specific holding time criteria for the other radionuclide parameters, a written report must be submitted within thirty-five (35) days after receipt of the last sample within each sample delivery group (SDG).

10.7 Analytical protocols required

HASL-300 EML Procedures Manual, U.S. Department of Energy, 28th Edition, Volume 1, February 1997 and/or EPA-600 4-80-032, Prescribed Procedures for Measurement of Radioactivity in Drinking Water, August 1980. (Cesium-137, Beryillium-7, Radium-226 and Thorium-234 can be determined by Gamma Spec. Lead-210 by Low energy Gamma Spec. or HASL-300 PB-1 or Extraction Chromatography with Alpha Spectrometry 2nd decay daughter Po-210.)

10.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The annual calibrations, historical backgrounds, and other relevant quality control data must be included in each data package.

The maximum number of samples in an SDG comprising an analytical batch is twenty (20). A sample receipt checklist (Attachment 1) must be filled out for every sample delivery received by the laboratory. The checklists associated with an SDG must be included in the data package. Any problems with sample check-in must be reported to the Malcolm Pirnie representative

immediately. The laboratory shall be required to electronically report sample check-in results daily on a web page developed by Malcolm Pirnie.

10.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request, and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory).

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of samples is received to go into PREmis and fill out the sample receipt form.

Sample results, instrument calibrations, calibration verifications, internal laboratory spike analyses, duplicate/replicate analyses, blank analyses, background analyses, sample spike analyses, counting efficiencies, background counting time, regions of interest (ROI) and number of counts per ROI must be reported in tabulated format. All QA/QC information, standard information and instrument printouts must be provided.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Minimum Detectable Activities (MDAs) for all analytes must be supplied with the data package.

10.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis the laboratory must supply a detailed example calculation that clearly demonstrates the manner in which the initial and final result was derived. Where applicable, each component of the calculation must be explained.

All results must be reported in pCi/g for solid samples (on a dry weight basis). Positive results must be reported to two (2) significant figures and less than detection limit results must be reported to one (1) significant figure.

Analytical uncertainties must be reported with all results in order to qualify the data. Results and uncertainties must be reported for all required analyses regardless of the size or sign of the result. The reported uncertainty must be the standard 2 sigma counting error.

The laboratory will be required to pulverize and homogenize the building material samples prior to analysis.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

10.11 Name of sampling/shipping contact

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10.12 Data Requirements

Matrix	Parameter	Reporting Limit (RL)
Filtrate (particles filtered from surface water)	Beryillium-7	<0.3 pCi/L
	Thorium-234	<03. pCi/L
Sediment	Cesium-137	<0.1 pCi/g
	Beryillium-7	<0.3 pCi/g
	Lead -210	< 0.1 pCi/g
	Radium-226	<0.5 pCi/g

10.13 Quality Control Requirements

The following audits are required where applicable.

Requirements	Frequency	Limits
Instrument Calibration	Yearly	Must be done at least annually
Calibration Verification	Weekly	**Gamma Spectroscopy** Detector Resolution – within ± 0.4 Full Width at Half Maximum (FWHM) Energy - within ± 1 keV of the known energies Efficiency - 90 – 110% of the efficiency determined during the initial calibration **Alpha Spectroscopy -** Detector Resolution - within ± 2% or 100 keV Energy – within + 25 keV of the initial energy determined at the time of calibration. Efficiency – 90-100% of the efficiency determined during initial calibration
Detector Background	Monthly/Weekly	**Gamma Spectroscopy** - ± 3 standard deviations of the long-term average background spectra of the detector **Alpha Spectroscopy** - ± 3 standard deviations of the previous background
Laboratory Duplicate	1 per 20 samples per matrix	Sediment/Filtrate Samples – RPD≤ 35% or Difference ≤ 2 X detection limit
Chemical Tracer Recovery	1 per sample batch	50-100% R -Required for **Alpha Spectroscopy only**.
Laboratory Control Sample	1 per 20 samples per matrix	50-100% R -Required for **Alpha Spectroscopy only.**

10.14 Action required if limits are exceeded

Initial Calibration

For Gamma Spectroscopy the detectors must be calibrated with a mixed energy standard (approximately 300 - 1800 keV) to obtain the counting efficiency vs. energy curves. A plot of the efficiency curves for all geometries should result in a smooth log-log curve. In addition, the laboratory must participate in an interlaboratory comparison crosscheck program, and the laboratory must have passed the most recent round of intercomparison measurements. The laboratory must pass all required initial calibration criteria prior to beginning sample analysis.

For Alpha Spectroscopy, the detectors must be calibrated with a standard traceable to NIST to obtain the counting time efficiency for each given region of interest. The counting errors must be <5%. The laboratory must pass all required initial calibration criteria prior to beginning samples analysis.

Calibration Verification

If the calibration verification does not meet the required limits, analysis must be stopped and the problem corrected. The instrument will then be recalibrated, and the calibration verified. Sample analysis cannot begin until the control limits are met.

Detector Background

Detector background must be performed monthly (at a minimum) for gamma spectroscopy and weekly (at a minimum) for alpha spectroscopy and flow proportional methods. The detector background criteria must be met prior to the start of sample analysis.

Laboratory Duplicate

Duplicate analyses that exceed the control limits must be re-prepared (as applicable) and reanalyzed one time only, with all results being reported. Any problems encountered, as well as any corrective actions taken, must be reported in the case narrative.

Chemical Tracer Recovery

Chemical Tracer Recovery which exceeds the control limits must be re-prepared (as applicable) and reanalyzed one time only, with all results reported. Any problems, as well as nay corrective actions taken, must be reported in the case narrative. It should be noted that the tracer solutions cannot be prepared prior to the sample analysis date.

Laboratory Control Sample

If LCS results fall outside the control limits, the analysis must be stopped and the problem corrected. All samples associated with the out of control LCS should be reanalyzed.

10.15 QA/QC problems are to be noted in the case narrative and immediately reported to the Malcolm Pirnie representative. If further assistance is required, the Malcolm Pirnie representative should be contacted for instruction Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

11 STATEMENT OF WORK – CATION-EXCHANGE CAPACITY (CEC)

11.1 General description of analytical service requested

Analysis of sediment samples for Cation-Exchange Capacity.

11.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Sediment	SW-846, Method 9081, Cation-Exchange Capacity of Soils (Sodium Acetate) plus any medications needed to prepare sediments

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

11.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

11.4 Estimated date(s) of sample collection

May 2005 – December 2007.

11.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

11.6 Holding time and number of days to analysis

Samples should be maintained at 4^{o}C until analysis. Holding time is 6 month.

11.7 Analytical protocol required

SW-846, Method 9081, Cation-Exchange Capacity of Soils (Sodium Acetate) plus any medications needed to prepare sediments

11.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to all SW-846 Method 9081 protocols and requirements.

11.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request, and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory).

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The

laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of samples is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

11.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

11.11 Name of sampling/shipping contact

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11.12 Data Requirements

Matrix	Parameter	Reporting Limit
Sediment	Cation-Exchange Capacity (CEC)	Follow the reporting requirements of the method.

11.13 Quality Control Requirements

The following audits are required where applicable.

Audits Required	Frequency of Audits	Limit
Method Blank	1 per sample batch	≤ detection limit
Duplicate Analysis	1 per sample batch	RPD ≤ 20%
Lab Control Standard	1 per sample batch	80 - 120 % R

Notes:

A sample batch is composed of a maximum of twenty (20) samples which have all been prepared on the same day.

Laboratory duplicates, method blanks, and LCS must be carried through the entire preparation and analytical procedures.

11.14 Action required if limits are exceeded

Method Blank

All positive sample results must be associated with an acceptable method blank. If the method blank exceeds the control limits the instrument should be recalibrated and the preparation blank re-prepared and reanalyzed. The blank acceptance criteria must be met prior to sample analysis.

Duplicate

Duplicate analyses which exceed the control limits must be re-prepared and reanalyzed one time only, with all results being reported. Any problems encountered as well as any corrective actions taken must be reported in the case narrative.

Laboratory Control Standard (LCS)

The LCS must be analyzed using the same sample preparations, analytical methods, and QA/QC procedures employed for the samples. If the LCS results fall outside the control limits, the analyses must be stopped, the problem corrected, and the samples associated with the out of control LCS reanalyzed.

11.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

12 STATEMENT OF WORK – MOISTURE

12.1 General description of analytical service requested

Determination of moisture in sediment.

12.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Sediment	ASTM D 2974, Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils – Test Method A

[a] It should be noted that the exact number of field samples plus associated QC will be field determined and is subject to change.

12.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

12.4 Estimated date(s) of sample collection

May 2005 – December 2007.

12.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

12.6 Holding time and number of days to analysis

Samples must be stored in airtight container at 4^{o}C and should be tested as soon as practice after sampling.

12.7 Analytical protocol required

Parameter	Analysis
% Moisture in Sediment	ASTM D 2974, Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils – Test Method A

12.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to ASTM D 2974 protocols and requirements.

12.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request, and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory).

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of samples is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

12.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

An initial demonstration of capability is required by the laboratory for all applicable methods prior to analyzing environmental samples. This should include specific performance criteria required by the method and when appropriate for the method a determination of method detection limit (MDL). In addition, each analyst must also have completed a demonstration of capability prior to analyzing environmental samples. If modifications are made to a method protocol which could change detection limits, the initial demonstration of capability must be repeated.

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12.12 Data Requirements

Matrix	Analysis	Reporting Limit (RL)
Sediment	% Moisture content, total mass	0.1 %
	% Moisture, oven-dried mass	0.1%

Note: % Moisture should be calculated both on a percentage of total mass or as-received and also by the alternate calculation given in D2974 as a percentage of oven-dried mass. The % moisture by oven-dried mass is used for Geotechnical purposes.

12.13 Quality Control Requirements

The following audits are required where applicable.

Audits Required	Frequency of Audits	Limits
MS	Per matrix, at least one per batch of 20 samples or less	95-105 %R
Lab Duplicate	1 per batch of samples	RPD $\leq$ 20% or Diff $\leq$ DL

Notes:

A sample batch is composed of a maximum of twenty (20) samples which have all been prepared on the same day.

Laboratory duplicates must be carried through the entire preparation and analytical procedures.

12.14 Action required if limits are exceeded

MS

MS analyses that exceed the control limits must be re-prepared (as applicable) and reanalyzed one time only, with all results being reported. Any problems encountered, as well as any corrective actions taken, must be reported in the case narrative.

Lab Duplicate

Duplicate analyses which exceed the control limits must be reported in the case Narrative.

12.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

13 STATEMENT OF WORK – GRAIN SIZE (sieve and hydrometer)

13.1 General description of analytical service requested

Determination of sediment grain size.

13.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Sediment	Grain Size (sieve and hydrometer) by ASTM D422, Standard Test Method for Particle-Size Analysis of Soils

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

13.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

13.4 Estimated date(s) of sample collection

May 2005 – December 2007.

13.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

13.6 Holding time and number of days to analysis

Samples must be stored in airtight container at 4^{o}C and should be tested as soon as practice after sampling. Max. holding time of 6 months.

13.7 Analytical protocol required

Parameter	Analysis
Grain size (sieve and hydrometer)	ASTM D422, Standard Test Method for Particle-Size Analysis of Soils

13.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to all ASTM D 422 protocols and requirements.

13.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request, and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory).

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a

shipment of samples is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

13.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

13.11 Name of sampling/shipping contact

James McCann
17-17 Route 208 North
Second Floor
Fair Lawn, New Jersey 07410
201-398-4310 (Direct)
201-797-7400 (Office)
201-797-4399 (fax)
jmccann@pirnie.com

13.12 Data Requirements

Matrix	Test	Reporting Requirements
Sediment	Grain Size Distribution (sieve and hydrometer)	Follow the reporting requirements in D422.

13.13 Quality Control Requirements

Follow criteria included in ASTM D422.

13.14 Action required if limits are exceeded

Follow criteria included in ASTM D422.

13.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

14 STATEMENT OF WORK – DENSITY (SPECIFC GRAVITY)

14.1 General description of analytical service requested

Determination of the specific gravity of sediment.

14.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Sediment	ASTM D854, Standard Test Method for Specific Gravity of Soil Solids by Water Pyconmeter

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

14.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

14.4 Estimated date(s) of sample collection

May 2005 – December 2007.

14.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

14.6 Holding time and number of days to analysis

Store at 4^{o}C for up to 6 months.

14.7 Analytical protocol required

Parameter	Analysis
Specific Gravity	ASTM D854, Standard Test Method for Specific Gravity of Soil Solids by Water Pyconmeter

14.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to all ASTM D 854 protocols and requirements.

14.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request, and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory).

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of samples is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

Method Detection Limits (MDLs) must be supplied with the data package.

14.10 Other

The laboratory must supply any and all information required to reproduce, during independent data review, all results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

14.11 Name of sampling/shipping contact

James McCann
17-17 Route 208 North
Second Floor
Fair Lawn, New Jersey 07410
201-398-4310 (Direct)
201-797-7400 (Office)
201-797-4399 (fax)
jmccann@pirnie.com

14.12 Data Requirements

Matrix	Analysis	Detection Limit
Sediment	Specific Gravity -	Follow the reporting requirements in D854.

14.13 Quality Control Requirements

Follow criteria included in ASTM D854.

14.14 Action required if limits are exceeded

Follow criteria included in ASTM D854.

14.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

15 STATEMENT OF WORK – SHEAR STRESS

15.1 General description of analytical service requested

Determination of the specific gravity of sediment.

15.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Sediment	ASTM D3080, Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

15.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

15.4 Estimated date(s) of sample collection

May 2005 – December 2007.

15.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate all samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

15.6 Holding time and number of days to analysis

Store at 4^{o}C for up to 6 months.

15.7 Analytical protocol required

Parameter	Analysis
Shear Stress	ASTM D 3080, Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions

15.8 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to all ASTM D 3080 protocols and requirements.

15.9 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit all documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request, and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory).

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of samples is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

15.10 Other

The laboratory must supply any and information required to reproduce, during independent data review, results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

15.11 Name of sampling/shipping contact

James McCann
17-17 Route 208 North
Second Floor
Fair Lawn, New Jersey 07410
201-398-4310 (Direct)
201-797-7400 (Office)
201-797-4399 (fax)
jmccann@pirnie.com

15.12 Data Requirements

Matrix	Analysis	Detection Limit
Sediment	Shear Stress	Follow the reporting requirements in D3080.

15.13 Quality Control Requirements

Follow criteria included in ASTM D3080.

15.14 Action required if limits are exceeded

Follow criteria included in ASTM D3080.

15.15 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

16 STATEMENT OF WORK – ATTERBERG LIMITS BY ASTM D4318

16.1 General description of analytical service requested

Determination of the specific gravity of sediment.

16.2 Definition and number of work units involved (specify whether whole samples or fractions; whether organic or inorganic; whether aqueous or soil and sediments; and whether low, medium, or high concentration

Number of Samples	Matrix	Analysis
TBD [a]	Sediment	ASTM D4318, Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

[a] It should be noted that the exact number of samples will be field determined and is subject to change.

16.3 Purpose of analysis (specify whether Superfund (enforcement or remedial action), RCRA, NPDES, etc.)

Superfund – RI/FS.

16.4 Estimated date(s) of sample collection

May 2005 – December 2007.

16.5 Estimated method of shipment

Samples will be shipped in accordance with USEPA and USDOT sample shipping protocols, on the day of their collection via an overnight courier to arrive Tuesday through Saturday. Since Saturday delivery of samples may be required, the laboratory must have personnel available Saturdays (except legal holidays) to receive, log-in, and refrigerate samples. If samples are shipped for Saturday delivery, then the laboratory will be notified prior to shipment.

16.6 Holding time and number of days to analysis

Samples must be stored in airtight container at 4^{o}C and should be tested as soon as practice after sampling. Max. holding time six months.

Parameter	Analysis
Shear Stress	ASTM D4318, Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

16.7 Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc)

The laboratory must adhere to ASTM D4318 protocols and requirements.

16.8 Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If questions arise, the laboratory will consult with Malcolm Pirnie's representative for clarification

The laboratory must submit documentation associated with the analysis of the samples including the packing list/Chain-of-Custody forms, a copy of this request, and analytical results on tabulated forms (the data sheets must include the dates the samples were collected, received and analyzed by the laboratory).

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The

laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of samples is received to go into PREmis and fill out the sample receipt form.

A written narrative describing any deficiencies encountered upon sample receipt, any problems encountered during analysis of samples. In addition, any corrective actions taken (including telephone logs, etc.) must describe the actual methods used from preparation to analysis. The report will be paginated.

16.9 Other

The laboratory must supply any and information required to reproduce, during independent data review, results reported by the laboratory. For each analysis, the laboratory must supply a detailed, example calculation that clearly demonstrates the manner in which the initial and final results were derived. Where applicable, each component of the calculation must be explained.

16.10 Name of sampling/shipping contact

James McCann
17-17 Route 208 North
Second Floor
Fair Lawn, New Jersey 07410
201-398-4310 (Direct)
201-797-7400 (Office)
201-797-4399 (fax)
jmccann@pirnie.com

16.11 Data Requirements

Matrix	Analysis	Reporting Limit
Sediment	Atterberg Limits	Follow the reporting requirements in D4318.

16.12 Quality Control Requirements

Follow criteria included in ASTM D4318.

16.13 Action required if limits are exceeded

Follow criteria included in ASTM D4318.

16.14 Turnaround Time

Guaranteed turnaround time for total data package will be:

[x] Normal – within 35 days after receipt of the last sample in this case.

[ ] Expedited – specify _____ days or by _____ date.

17 COMPENSATION:

The Laboratory's Total Compensation Authorized under this Task Order, which shall not be exceeded without prior written authorization of Malcolm Pirnie, is: **$**_____

[_____] Laboratory's proposal/quotation is incorporated and attached to this Task Order, except for the Laboratory's terms and conditions, if any.

18 CONTRACT:

The Agreement between Malcolm Pirnie and the Client, dated December 7, 2001, is incorporated by reference and is attached hereto as indicated:

[____] A check here indicates that the entire Contract is incorporated and attached to this Task Order.

[__X_] A check here indicates that certain provisions of the Contract are incorporated and attached to this Task Order.

Malcolm Pirnie and Laboratory shall be mutually bound by the terms of this Subcontract and, to the extent that provisions of Malcolm Pirnie's Contract apply to the work of the Laboratory, Laboratory shall assume toward Malcolm Pirnie all obligations which Malcolm Pirnie, under the Contract, assumes toward the Client. Malcolm Pirnie shall have the benefit of all rights, remedies and redress against the Laboratory, which the Client, under the Contract, has against Malcolm Pirnie. In the event of a conflict between the Contract and this Subcontract, the stricter terms and conditions, shall control.

19 TASK ORDER GENERAL SPECIFICATIONS

General Specifications as described in

Exhibit 1.1 of the Subcontract is hereby incorporated by reference as part of this Task Order.

An Electronic Data Deliverable (EDD) must be submitted for the data. The EDD format has to follow the format in the example EDD in the attached CD. If the EDD format is not correct, the laboratory will be required to fix the EDD and resubmit. The laboratory will be required to upload the EDD to PREmis, the project website. The laboratory is also responsible on the day a shipment of is received to go into PREmis and fill out the sample receipt form.

The laboratory should also have the capability to perform analysis of tissue samples, since we anticipate the project will also require the analysis of tissue samples in the future.

ISSUED AND AUTHORIZED BY: MALCOLM PIRNIE, INC.	**ACCEPTED AND AGREED TO BY: LABORATORY**
By: _____	By:_____
Title: _____	Title: _____
Date: _____	Date: _____

EXHIBIT 1.1

LABORATORY TASK ORDER
GENERAL SPECIFICATIONS

SECTION 1. SHIPMENT OF SAMPLE BOTTLES AND RECEIPT OF SAMPLES

1.1 **Pre-Sampling Preparation**. The Laboratory, upon receipt and acceptance of a Task Order, shall provide Malcolm Pirnie with sample bottles, sample shipping containers conforming to USDOT requirements, sample packing material, field blanks, trip blanks, analyte-free water, and laboratory distilled water. Sample bottles shall be prepared, cleaned and shipped to Malcolm Pirnie under custody in a manner consistent with USEPA CLP protocols unless otherwise specified in the Task Order. Unless otherwise agreed to in Item No. 3 of the Task Order, shipments must be received by Malcolm Pirnie no later than twenty-four (24) hours before the scheduled sampling event.

1.2 **Sample Delivery.** The Laboratory will accept deliveries of Samples at its premises Monday through Friday (except holidays) between the hours of 8:00 a.m. and 5:00 p.m., local time, unless notified by Malcolm Pirnie within forty-eight (48) hours that a shipment for Saturday delivery or other special shipments will be made. Deliveries of Samples will be deemed accepted by the Laboratory unless the Laboratory notifies Malcolm Pirnie in writing that the identification, labeling and content of the Samples do not correspond to the description of the Samples on the Task Order and the Chain of Custody. Samples delivery date (Receipt Date) to the Premises will be logged by the Laboratory.

1.3 **Sample Receipt Reports.** Upon request, the Laboratory shall contact Malcolm Pirnie each day a Sample or Samples are received detailing the date of receipt, the number of Samples received, the condition of the containers and contents, the parameters to be analyzed, anticipated analytical turnaround time, and the Laboratory's assigned Sample numbers.

1.4 **Chain-of-Custody Documentation.** Chain-of-Custody documentation shall be initiated at the Laboratory with the release of the Sample bottles from the Laboratory's preparation group for transport to Malcolm Pirnie. The field chain-of-custody documents, returning with the Samples after collection, shall terminate with the Laboratory's signature acknowledging receipt of the Samples from Malcolm Pirnie.

1.5 **Sample Inspection.** If, upon receipt by the Laboratory of a delivered Sample, the Laboratory in its reasonable judgment determines that, due to the nature of the composition of the Sample or otherwise, the tests or analyses specified or requested for such Samples by Malcolm Pirnie (on the Task Order or otherwise) are not practicable, are likely not to produce the desired results, or will require modification of the Laboratory's standard procedure, the Laboratory shall promptly notify Malcolm Pirnie of such determination. If, in the Laboratory's reasonable judgment, modified or different tests or analyses represent reasonably practicable alternatives to those originally specified or requested by Malcolm Pirnie, the Laboratory will quote a unit rate for such modified or different tests or analyses. Upon written affirmation by Malcolm Pirnie of its acceptance of such modified or different tests and analyses and the Laboratory's quoted unit rates therefore, the Task Order shall be deemed to be amended to reflect such modified or different tests and analyses (and related unit rates therefore) and the Laboratory will commence the processing of such Sample. The Receipt Date for any such Sample shall be the date on which Malcolm Pirnie affirms its acceptance of such modified or different tests and analyses.

1.6 **Sample Volume.** Malcolm Pirnie shall have sole responsibility to provide and deliver to the Laboratory the volume of samples specified or requested by the Laboratory. If the volume of any Samples received by the Laboratory is less than that so specified or requested, the Laboratory shall immediately notify Malcolm Pirnie of such and then may proceed to accept such Sample and commence testing and analysis of such Sample according the Laboratory's standard procedures or such other modified or different procedures as are, in the Laboratory's judgment, necessary or appropriate in light of the volume of such Sample received unless specifically requested not to do so by Malcolm Pirnie. The Laboratory shall have no liability or responsibility of any kind whatsoever arising out of or in connection with: the delivery by Malcolm Pirnie of insufficient volume of any Sample; for using modified or different procedures to test or analyze insufficient volumes of such Sample; for the inability to use the Laboratory's standard procedures for the testing or analysis of such Sample; or any inability to use the Laboratory's standard Quality Assurance procedures for or in connection with such Sample.

1.7 **Risk of Loss.** Prior to the receipt by the Laboratory or its agent(s) of any samples, the entire risk of loss or of damage to such Sample shall remain with Malcolm Pirnie. In no event will the Laboratory have any responsibility or liability for the action or inaction of any handling, shipment or delivery of Samples and/or shipping containers by Malcolm Pirnie to the Laboratory.

SECTION 2. DELIVERY OF SERVICES

2.1 **Analytical Methodologies.** The Laboratory will perform the services ordered by Malcolm Pirnie using analytical methodologies which are in conformity with methodologies prescribed by the Task Order. In cases where such methodologies have not been so prescribed or described, the Laboratory shall use methodologies generally recognized by USEPA, or other commercial laboratories in the trade as suitable for the services ordered. The Laboratory reserves the right to deviate from these methodologies not prescribed or described by USEPA if necessary or appropriate due to the nature or composition of the Sample to be tested or otherwise in the reasonable judgment of the Laboratory; any such deviations shall be made under the direction and approval of the Laboratory's Quality Assurance Officer. Malcolm Pirnie shall be notified of any deviations prior to commencing the analyses.

2.2 **Analytical Holding Times.** The Laboratory will comply with storage, processing and analytical holding time limits set forth in applicable regulations specifying analytical methods or in regulatory agency guidelines, such as USEPA CLP Guidelines or state equivalents, or otherwise reasonably requested by Malcolm Pirnie and quoted on the Task Order. For purposes of determining compliance with any such holding time limits, the Laboratory will assume that all Samples have been collected by Malcolm Pirnie no more than twenty-four (24) hours prior to the Laboratory's receipt of such Samples as provided in Section 4 of the Laboratory Task Order.

2.3 **Analytical Turnaround Time.** The Laboratory will comply with all other duly authorized and quoted service conditions. Analytical turnaround time (which means, the time from the Laboratory's acceptance of a Sample as provided in Section 1.2 of this Exhibit 1.1 to the release to Malcolm Pirnie of a written report of the results of its tests and services provided hereunder with respect to such Sample as provided in Section 2.6 of this Exhibit) shall be guaranteed to be **thirty (30) calendar days** unless specified in writing or in the Task Order.

2.4 **Expedited Service for Analytical Turnaround Time.** Upon the request of Malcolm Pirnie and subject to the approval of the Laboratory, the Laboratory may agree to perform services for Malcolm Pirnie on an expedited basis. If Malcolm Pirnie and Laboratory agree, to the extent set forth in the Task Order, the Laboratory may invoice an analytical turnaround time premium or surcharge for expedited services provided to Malcolm Pirnie. Unless agreed to by Malcolm Pirnie on an individual Task Order, the Laboratory's maximum premium or surcharge allowed are as follows:

15 to 29 day turnaround not more than	10% premium
8 to 14 day turnaround not more than	20% premium
2 to 7 day turnaround not more than	50% premium
one (1) day turnaround not more than	100% premium

In the event that expedited services cannot be performed as agreed by the Laboratory and results thereof provided in writing by the specified date, the Laboratory will, subject to the provisions of Section 2.7 of this Exhibit 1.1, provide complete verbal results by telephone to Malcolm Pirnie on such specified date in satisfaction of its response obligations under this Section. Written results will follow within five days. Premiums or surcharges for expedited services shall be reduced by ten (10) percent charged for each day after the specified due date that the written results of such expedited services are not received by Malcolm Pirnie.

2.5 **Delivery of Analytical Results.** The analytical turnaround time for delivery of Analytical Results shall be measured from the Receipt Date to the delivery date. The delivery date shall be considered to be the date of receipt by Malcolm Pirnie if sent by mail, courier, or express delivery service, or the date/time group if electronically transmitted. Late delivery of written reports of analytical results, under 2.3 or 2.4 above, beyond the thirty (30) calendar day guarantee delivery may subject the Laboratory to liquidated damages as described under Section 5 of this Subcontract.

2.6 **Reporting of Analytical Results.** The Laboratory will prepare and deliver to Malcolm Pirnie a written report of the results of the Laboratory's services with respect to a Sample upon completion of all services ordered by Malcolm Pirnie with respect to that Sample. Malcolm Pirnie may designate, in the Task Order, the format and content of such report in accordance with one of the Laboratory's standard report formats as modified by Malcolm Pirnie. Unless otherwise requested on the Task Order, data shall be reported in the appropriate metric units or as stated in the Task Order referenced methodology. Solid/ sediment samples shall be reported on a "dry weight" basis. Individual reporting limits shall be included for each analysis parameter.

2.7 **Reruns or Regeneration.**

2.7.1 When, in the reasonable judgment of the Laboratory's Quality Assurance Department, it is necessary or appropriate, and feasible, to rerun any tests or procedures or to regenerate data or test results derived from any Sample or any services performed by the Laboratory hereunder, the Laboratory may make such efforts to accomplish such rerun or regeneration as it deems reasonably necessary, including without limitation re-preparation or re-analysis of a Sample. The decision as to which Samples and services, if any, require (and permit) such rerunning or regeneration shall be within the sole discretion of the Laboratory's Quality Assurance Officer.

2.7.2 No consideration will be given to the sources, Receipt Dates or timing of Samples or services performed in determining which, if any, of such Samples or services require rerunning or regeneration. Sample reruns will be accepted as justification for exceeding

delivery dates if the Laboratory's Quality Assurance Officer determines that the nature of the Samples or analysis protocol necessitates this delay and immediately notified Malcolm Pirnie of such. The Laboratory's Quality Assurance Officer shall then confirm in writing within five (5) days for what reasons the nature of the Sample or analysis protocol necessitated a delay.

2.7.3 Sample reruns will not be accepted as justification for exceeding delivery dates if it is determined by Malcolm Pirnie that error or negligence by the Laboratory necessitated such reanalysis. The expense of such reruns discussed in this Section 2.7 shall be borne by the Laboratory.

SECTION 3. STORAGE AND DISPOSAL OF SAMPLES

3.1 **Reasonable Storage Period.** The Laboratory will maintain in a reasonable storage facility material which is part of or related to a Sample, after delivery to Malcolm Pirnie of the Laboratory's final written report with respect to such Sample, for the periods indicated below unless otherwise directed by Malcolm Pirnie.

Material	Storage Periods
Aliquots, portions or residual quantities of the original Sample.	60 days
Extracts of concentrates from original Sample.	180 days
Hardcopy data or test results	The longer of 1 year or the period specified in the Contract.
Magnetic data or test results	The longer of 3 years or the period specified in the Contract.

3.2 **Extended Storage.** In the event that Malcolm Pirnie shall require the Laboratory to store Samples and related information for a period longer than the period specified in Section 3.1 of this Exhibit 1.1, Malcolm Pirnie shall notify Laboratory in writing of the increased Storage Period two weeks prior to the expiration of the Storage Periods set forth above. If authorized to store samples for such longer periods, the Laboratory and Malcolm Pirnie shall negotiate an equitable adjustment to Laboratory's compensation.

SECTION 4. INSPECTION OF LABORATORY RECORDS AND FACILITIES

4.1 **Inspection.** Malcolm Pirnie and/or the Client may inspect the Laboratory's facilities at its Premises during normal business hours. Malcolm Pirnie and/or the Client may review data (if any) prepared by the Laboratory for Quality Assurance purposes which were produced using Malcolm Pirnie's Samples or are directly related thereto or the Laboratory's services hereunder, such as spikes, surrogates, duplicates and blanks.

4.2 **Notice of Inspection.** Malcolm Pirnie and/or the Client shall give the Laboratory notice of any request for an inspection of the Premises pursuant to Section 4.1 of this Exhibit 1.1 or review of Quality Assurance data pursuant to Section 5.2 of this Exhibit 1.1 at least three (3) business days in advance of the desired date of such inspection or review. In all cases, the actual inspection or data review will be limited to the purposes or objectives specified in Malcolm Pirnie's notice.

SECTION 5. DATA CONFORMANCE

5.1 **Conformance.** Prior to delivery of analytical results to Malcolm Pirnie, a senior Laboratory manager will review all data including Quality Assurance/Quality Control results to determine conformance with the requirements of the applicable analytical methodology and this Section. Adequate written documentation of this review, signed by the Laboratory's management representative will accompany analytical results submitted to Malcolm Pirnie.

5.2 **Conformance Documentation.** Written documentation shall include accurate and complete explanations for the following occurrences:

5.2.1 Detection limits or minimum quantification limits elevated above those required by the USEPA CLP program (or other requirements consistent with methodologies specified in the Task Order).

5.2.2 Contamination of blanks in excess of USEPA CLP requirements (or other requirements consistent with methodologies specified in the Task Order).

5.2.3 Failure of surrogate and/or spike recovery results to meet acceptance criteria specified in the USEPA CLP Statement of Work (or other criteria consistent with methodologies specified in the Task Order).

5.2.4 Failure of matrix spike and matrix spike duplicate analyses to meet acceptable criteria for percent recovery and relative percent difference (RPD) as specified in the USEPA CLP Statement of Work (or other criteria consistent with methodologies specified in the Task Order).

5.3 **Conformance Standard.** The Laboratory shall perform a statistical analysis to determine the mean analytical results or performance of Malcolm Pirnie's quality assurance (QA) analyses. The Laboratory shall validate that the percentage of QA analyses that, within acceptable ranges, does not exceed acceptable standards specified in the USEPA CLP Statement of Work (or other acceptable standards consistent with the methodologies specified in the Task Order).

5.4 **Conformance Report.** The Laboratory's Director of Quality Assurance shall confirm in writing that analytical data submitted to Malcolm Pirnie has been reviewed and is acceptable based on his review and evaluation of QA analyses appropriate for the methodology used and as described in this Section.

SECTION 6. INDEPENDENT VALIDATION

6.1 **Independent Validation.** The analytical data may be subject to validation by Malcolm Pirnie or by an independent validator, including, but not limited to the USEPA and other regulatory agencies, to evaluate the quality and useability of the data for Malcolm Pirnie's intended purpose. The procedures to validate such data shall be determined by Malcolm Pirnie or the independent validator, including, but not limited to the use of EPA CLP validation procedures.

SECTION 7. CURE AND REPERFORMANCE

7.1 **Cure of Data Package.** The Laboratory may be required to cure analytical data packages that are unusable or of limited or qualified use, as determined during an independent validation under Section 6, in accordance with appropriate procedures or guidelines used by USEPA or State agencies. If the data remain unusable or its use limited or qualified, the Laboratory may be required to reimburse Malcolm Pirnie for all damages, costs or expenses as specified elsewhere in this Subcontract and in Section 7.2 below.

7.2 **Reperformance.** The Laboratory's obligation to repeat any services with respect to any Sample shall be contingent on Malcolm Pirnie's providing, at the request of the Laboratory, an additional Sample or Samples. If repeat analysis is required due to the sample(s) being lost, destroyed or made useless due to the Laboratory's negligence or failure to act, including without limitation, exceeded holding times, reasonable costs incurred by Malcolm Pirnie, the Client, their agents or subcontractors, including without limitation, costs of remobilizing in the field (i.e., drilling or excavation), resampling, reanalyses and all ancillary and incidental administrative and management costs and expenses shall be reimbursed by Laboratory within five (5) calendar days of demand by Malcolm Pirnie.

Attachment 4

SOP No. 10: Procedure to Conduct Sample Management for CLP and non-CLP Samples

Title: Procedure to Conduct Sample Management for CLP and non-CLP Samples

I. Introduction

This guideline is to provide reference information on sample management procedures.

II. Definitions

Contract Laboratory Program (CLP). The U.S. Environmental Protection Agency (USEPA) CLP was developed to retain laboratory services that will ensure that all environmental samples collected under the Superfund Program will be analyzed in accordance with recognized EPA laboratory methods and quality assurance/quality control (QA/QC) procedures.

Target Compound List (TCL). This is a list of organic compounds typically analyzed for by the CLP. The list is broken into three subdivisions; volatiles, semi-volatiles and pesticide/PCBs.

Target Analyte List (TAL). This is a list of inorganic parameters typically analyzed for by the CLP. Parameters on this list include heavy metals and cyanide.

Routine Analytical Services (RAS). Laboratory analysis for substances or parameters shown on the TCL and TAL in solid and aqueous samples.

non-RAS. Laboratory analysis for substances or parameters not shown on the TCL and TAL. Analysis of non-soil/sediment, nonaqueous matrices, and analysis of RAS compounds using non-RAS protocols.

Trip Blanks. Trip blanks are used to check for sample contamination originating from sample transport and shipping, as well as from site conditions. Trip blanks are necessary when aqueous environmental samples are collected for volatile organic analysis.

Rinsate Blanks. Rinsate blanks, also known as field blanks, are used to check the efficacy of sampling equipment decontamination procedures. Rinsates are collected for each type of sampling equipment used on site. Demonstrated analyte-free water is poured over the equipment and collected into containers and analyzed for the analytes of concern.

Environmental Duplicate. These are two separate samples collected at the same sampling point. Environmental duplicates are used to determine field sampling precision and are collected at a set frequency for each analyte group. For VOC samples, duplicate samples are

collocated samples. For all other parameters, a sample aliquot is homogenized and split into two sampling containers.

Matrix Spike/Matrix Spike Duplicates (MS/MSD). This is the process by which standard mixes of various organic TCL compounds are added to environmental samples prior to extraction. The sample is split into duplicates and analyzed. The analysis is used to evaluate the matrix effect of the sample upon the analytical methodology. Triple volume of aqueous samples for MS/MSD analysis is collected in the field, at a frequency of at least 5 percent per matrix/concentration. No extra volume is required for the soil samples.

Matrix Spike/Matrix Duplicates (MS/MD). The spike analysis is the process by which standard mixes of various inorganic TAL parameters are added to environmental samples prior to digestion. The analysis is used to evaluate the matrix effect of the sample upon the analytical methodology. The duplicate analysis in the process where the assigned sample is split in two and analyzed at the laboratory. The analysis is an indicator of a laboratories analytical precision based on each sample matrix. Double volume of aqueous samples for MS/MD analysis is collected in the field, at a frequency of at least 5 percent per matrix/concentration. No extra volume is required for soil samples.

Low-Concentration Sample. Samples in which a compound may be present at concentration levels less than 10.0 ppm.

Medium-Concentration Sample. Samples in which a compound may be present at concentration levels equal to or greater than 10.0 ppm to as much as 15 percent 150,000 ppm) of the total sample.

High-Concentration Sample. Samples in which a compound may be present at concentration levels greater than 15 percent (150,000 ppm) of the total sample.

III. Guidelines

The purpose of sample management is to assure that all samples collected during this hazardous waste site investigation are accounted for when the project is completed. The sample management officer is also responsible for assuring that the proper quality assurance/quality control (QA/QC) samples are collected. These purposes are achieved by adhering to the following procedures:

1) Laboratory Coordination

a) CLP Samples

Prior to collecting any samples, a request must be made through RSCC for a laboratory. At this time, any requested modifications to the CLP SOWs must also be

described (*e.g.*, lower detection limits, adding a parameter, such as titanium, to the TAL, requesting a quicker turnaround time (TAT)). A description of how to request CLP services is including in Section 2.4 of USEPA's CLP Guidance for Field Samplers, OSWER 9240.0-35, August 2004. A request for CLP services includes the following:

i) Contact RSCC to obtain CLP sample numbers – these are unique numbers used to identify each sample. For this project, a large block of CLP numbers will be set aside by RSCC prior to beginning sampling. Therefore, it is likely that these numbers will only need to be requested once. Refer to Attachment 1 for a memo describing some modifications to the CLP that were agreed to by RSCC for the Lower Passaic River Restoration Project.
ii) Fill out an RSCC request form. This must be sent to RSCC by 12:00 pm on the Tuesday prior to week of the sampling event.
iii) RSCC will contact the originator of the request by Friday with the Case Number and assigned laboratories. At times, the USEPA-DESA Laboratory will choose to perform all or part of the analysis requested.
iv) Since this is a long-term project, weekly contact will be maintained with RSCC.

b) Non CLP Samples

Two prime subcontractor laboratories will be procured for the Lower Passaic River Restoration project to conduct analysis of non-CLP parameters. Weekly contact must be maintained with these laboratories to inform them of upcoming sampling.

2) <u>Preparing the Sample Containers</u>

a) Malcolm Pirnie will purchase certified clean sample containers from an approved supplier. Copies of these certifications will be brought to the site while sampling and then kept in site files for future reference.

b) Each bottle used to collect a sample must be identified by a supplier and lot number to ensure that it is permanently associated with the sample collected in that particular container. This procedure also applies to containers used to carry demonstrated analyte-free water to be used for blank preparation. This is to ensure that for all samples collected, the specific sample bottles used can be traced to the sample container contractor, QC certification paperwork and custody records applicable to their identifying lot numbers.

3) <u>QA/QC Samples</u>

a) <u>Trip Blanks</u>

i) One trip blank is required for each day that aqueous environmental samples are collected for volatile analysis.

ii) Trip blanks are only necessary for aqueous environmental samples. If rinsates are the only aqueous samples collected, then a trip blank is not necessary.

iii) Trip blanks consist of two 40 mL septum vials into which 4-5 drops of 1:1 hydrochloric acid (HCl) is introduced prior to filling them with demonstrated analyte-free water.

iv) Trip blanks are prepared in the field in the clean zone. They then remain with the field personnel throughout the sampling event and are shipped with the volatile cooler. Every aqueous environmental sample cooler must contain a trip blank in it.

v) The trip blank must be stored away from solvents and must be preserved, packaged, cooled to 4-6^{o}C and shipped to the laboratory with the other aqueous samples.

b) Rinsate Blanks

i) Rinsate blanks are collected for each type of equipment used to collect samples. The rinsates will be collected at a timed frequency depending on the sample capacity. At a minimum, rinsates have to be collected at one per week. At a maximum, rinsates have to be collected at one per day. Decontaminated equipment must be properly stored in an area and in a manner that will prevent cross contamination.

ii) Where possible, composite rinsates will be collected from all equipment associated to a particular matrix for analysis of non-volatile parameters. A separate rinsate will be collected for each type of equipment associated to a particular sample matrix which will be analyzed for volatile organics.

iii) Rinsate blanks consist of pouring demonstrated analyte-free water over clean equipment and collecting it into sample containers to be analyzed for the analytes of concern.

iv) Rinsate blanks are preserved, packaged, and shipped in the same manner as low concentration aqueous environmental samples.

c) Environmental Duplicates

i) Samples for duplicate analysis are collected in the field, for each matrix sampled at a frequency as described in Lab Task Order.

ii) Sufficient quantity of matrix must be collected from the same sample location to fill a duplicate set of sample containers. The duplicate volume is shipped to the laboratory under a separate CLP sample number.

iii) For soil/sediment samples the volatile organic fraction is collected as collocated grab samples while the non-volatile fraction is homogenized prior to collection.

d) Matrix Spike/Matrix Spike Duplicate (MS/MSD) & Matrix Spike/Matrix Duplicate (MS/MD)

i) The designation of a sample for MS/MSD analysis for organics and MS/MD analysis for inorganics is required for 1 in 20 environmental samples per concentration/matrix.

ii) Three times the total volume is necessary for collection of aqueous MS/MSD organic samples. Two times the total volume is necessary for collection of aqueous inorganic MS/MD samples. No extra volume is required for the soil samples.

iii) MS/MSD and MS/MD samples are noted as such on the chain of custody (COC).

4) Sample Documentation, Packaging, and Shipping Procedures

One or more of the field personnel will be designated as the sample management officer(s). The sample management officer will bear the ultimate responsibility for the documentation, packaging, and shipping of the samples. These procedures are outlined below.

a) Documentation/Chain of Custody

For documentation purposes, the field team will enter information about each sample into the field laptop as they collect the sample. As this information is entered into the laptop, it is transmitted to the PREmis database. Information recorded includes the following:

- Sample date and time of collection
- Associated QC samples
- Analyses required
- Bar code number – since the bottles do not receive sample labels until they are returned to the field office, a sample bar code is placed on each bottle when the samples are collected. This information is entered into the field application so the bar code is permanently associated with a specific sample bottle.

i) Since all of the sampling information is recorded electronically the sample management officer can electronically generate the COC and sample labels. The sample management officer needs to access the sample management PREmis module. This will allows the sample management officer to designate which samples are in which shipment. This is required since there will be numerous laboratories for this project.

ii) Once all of the samples are associated to a shipment, the COC and sample labels can be printed from PREmis. The sample labels are affixed to each sample container and covered with clear tape. In addition, for CLP samples, a sample label is placed on the sample tag. The sample labels will contain the following information:

- MPI-designated sample number

- For CLP samples only, the assigned CLP Number
- The month, day, and year the sample was collected
- The type of analysis requested
- The type of preservation performed in the field.

b) Packaging and Shipping Samples

i) Make sure the caps on the sample bottles are tightly sealed. Wipe down the outside of all of the sample bottles.

ii) Preserve the samples according to the SOP No. 2 for Sample Preservation.

iii) Apply one custody seal around the circumference of the container or over the cap and onto the sides of the container. The custody seal must applied to sample containers in such a manner as to reveal if the container was opened during transit. Note: Septum vials should not be covered over the top.

iv) Place each container in its own ziplock bag. The two 40 ml vials may be placed in one bag. Eliminate extra air space from the bag before sealing. The EnCore® device comes in its own ziplock bag and this bag will be used.

v) For CLP samples, place the associated sample tag into the ziplock bag with the sample.

vi) Prepare the shipping container (usually a cooler). The cooler will be prepared so that no leakage can occur during shipping. All valves on the cooler will be securely duct taped, both inside and outside the cooler, and the cooler will be lined with either plastic or a large garbage bag. Only coolers that conform to the general design requirements in 49 CFR 173.410 will be used for shipment.

vii) The VOC samples should be packed together, without any other sample fraction, with the trip blank.

viii) Put 1-2 inches of packing material in the bottom of the coolers, then place the samples into the cooler.

ix) Surround the sample bottles with bags of ice (only the samples that need to be cooled – Refer to the SOP for Sample Preservation No. 2. The ice will not be kept in its original bag, but will be repacked into ziplock bags. Use enough ice to ensure that the proper temperature (4-6^{o}C) is maintained during transport. Place a temperature blank (40-mL vial filled with DI water) into the cooler.

x) Place packing material over and around the sample bottles. Sufficient packing material must be used to the bottles will not move or break during transport.

xi) Once the samples are packed, the plastic or garbage bag will be closed and securely taped.

xii) Prior to shipment the relinquished by and received by sections of the COC form will be filled in. Generally, the shipper will not sign the COC. Therefore, the carrier's name is filled in by the sample management officer. The COC form will then be placed in a ziplock bag and taped to the inside of one of the coolers.

xiii) For CLP samples, one copy of the COC form will be retained by the sample management officer and one copy will be sent to RSCC. For non-CLP samples, one copy of the COC form will be retained by the sample management officer.

xiv) Close the cooler and seal with strapping tape. If visibly dirty, the outside of the cooler will be wiped down. Apply signed and dated custody seals to the cooler. Place two custody seals diagonally across from each other where the cooler lid meets the cooler. The custody seals will be applied in such a manner as to reveal if the cooler was opened during transit.

xv) An address label will be placed on the outside of each cooler. The label will be covered with clear tape. If more than one cooler is being sent to one destination, each cooler will be appropriately labeled as 1 of X, 2 of X, *etc.* The airbill will be attached to one of the coolers. Usually, the samples will be sent via overnight carrier for next day delivery. This should be confirmed with the Field Team Leader.

xvi) The laboratory will be notified of the shipment before 9 a.m. ET on the day after shipping. For CLP samples, fill out the Sample Shipping Call-In Form. Call or fax the shipping information to RSCC by 9:00 am the following morning. For non-CLP samples, the notification system agreed to in the subcontract will be followed.

Note: Some samples have very short holding times. In some limited instances, the samples may be either hand delivered to a laboratory or picked up by the laboratory's courier service.

ATTACHMENT 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II

DATE: January 14, 2004

SUBJECT: Request for Modifications of CLP Requirements for the Lower Passaic River Restoration Project

FROM: Jennifer E. Feranda, CLP Project Officer/RSCC Coordinator
Hazardous Waste Support Section (2DESA-HWSB)

TO: Alice Yeh, Remedial Project Manager
2ERRD

The purpose of this memorandum is to follow up on your letter of July 25, 2003 and sub-sequent phone conversations concerning the request for modifications of Contract Laboratory Program (CLP) requirements for the Lower Passaic River Restoration Project. Below, I have outlined your specific requests as well as provided HWSB response(s) as to whether or not these requests can be accommodate.

If you have any questions or would like to discuss this in more detail, please do not hesitate to call me at (732) 321-6687.

Response to Requests for Modifications of CLP Requirements for
the Lower Passaic River Restoration Project

Request for Modification to FORMS II Lite Application Requirement

1) ***Request:*** Malcolm Pirnie (MPI) has developed a web-based data management system named PREmis (the Passaic River Estuary management information system) to handle existing historical data and new data collected for the Remedial Investigation/Feasibility Study (RI/FS) of the Lower Passaic River. PREmis contains all the fields required by FORMS II Lite, but also has numerous additional data requirements associated with the unusually complex modeling effort planned for the Lower Passaic River Restoration Project. It was requested that the use of PREmis be granted in lieu of the use of FORMS II Lite. Information contained in the PRE mis database would be directly copied into the FORMS II Lite database, thereby satisfying the FORMS II Lite reporting requirements.

Response: PREmis can be used for the project, however, it can not be used in lieu of FORMS II Lite. Traffic Reports/Chain of Custody (TR/COC) forms that accompany samples to the laboratories will need to be generated by FORMS II Lite. In addition, either the XML files with information from the FORMS II Lite database or hard copies of the TR/COCs will need to be transmitted to the CLP's Sample Management Office (SMO) on a pre-determined schedule (within a day or two of sample shipment).

Request for Modifications to the Contract Laboratory (CLP) Requirements

2) ***Request:*** A specific cohort of laboratories (both organic and inorganic) would be assigned to the project for the duration of the Remedial Investigation sampling program (several years) prior to the beginning of sampling. The Passaic River Estuary project team would determine which laboratories receive specific samples.

***Response*:** This request can not be accommodate. Due to laboratory capacity, laboratory performance, and turn over of contracts, specific labs can not be committed to an entire project. The frequency that laboratory space is booked and the length of time that a lab or labs can be utilized will be determined as we get closer to the actual sampling event. Based on the number of labs being used and their capabilities per their contracts, the Lower Passaic River project team may or may not be able to determine what labs receive specific samples (*e.g.*, if there are two labs assigned, one organic and one inorganic, organic samples must go to the organic lab)

3) ***Request:*** All sample log-in information would be entered into the PREmis Website by the laboratory instead of onto hard copy log-in sheets.

Response: Due to the requirements and constraints of the CLP contracts, this request will not

be able to be accommodated at this time.

4) ***Request***: A large block of sequential CLP number, both organic and inorganic, would be designated specifically for this project.

Response: Starting and ending CLP sample numbers will be assigned for this specific project. PREmis can be used to generate a large block of sequential CLP sample numbers, both organic and inorganic as needed during the project.

5) ***Request:*** Laboratories would be required to submit EDDs according to project specific standards in a timely manner, usually with the hard copy of the CLP package. If the EDD format were incorrect, the laboratory would need to submit a corrected EDD.

Response: Electronic data deliverables (EDDs) will be submitted to the data user(s) in the Multimedia Electronic Data Deliverable (MEDD) format. The EDDs will transmitted to the data users by EPA Hazardous Waste Support Section (HWSS) staff once data has been reviewed for contract compliance. Any incorrect or incomplete EDDs will be corrected prior to the data users receiving the files. The time frame for receipt of these deliverables will be pre-determined prior to the start of sampling for this project.

Attachment 5

SOP No. 11: Procedure to Conduct Sample Preservation

Title: Procedure to Conduct Sample Preservation

I. Introduction

This guideline is to provide reference information on the accepted methods of sample preservation.

II. Materials

Preservatives:

a. 1:1 HCl - (Hydrochloric Acid/Deionized Water)
b. HNO_3 - full strength (Nitric Acid)
c. NaOH - 10 N (Sodium Hydroxide)
d. H_2SO_4 - full strength (Sulfuric Acid)

Additional Materials:

a. Disposable Pasteur pipettes
b. Pipette pumps - 10 ml or 2 ml
c. Latex pipette bulbs
d. Squeeze bottle with deionized water
e. Clear wide mouth glass jar for water pipette
f. Paper towels
g. Lead acetate paper
h. Cadmium nitrate or cadmium carbonate (if using lead acetate paper)
i. Potassium iodide - starch test paper (KI-starch paper)
j. Ascorbic Acid (if using KI starch paper)
k. Filter paper
l. Filter funnels (disposable or decontaminated)
m. Filter vessel with hand pump
n. pH paper
o. Scale

Safety Materials:

a. 2 pair safety glasses
b. 2 pair solvex gloves
c. 2 labcoats
d. MSDS sheets
e. Eyewash

III. Discussion

Complete and unequivocal preservation of samples is a practical impossibility. At best, preservation techniques slow down the chemical and biological changes that inevitably continue after the sample is removed from the parent source. The changes that take place in a sample are either chemical or biological. In the former case, certain changes occur in the chemical structure of the constituents that are a function of physical conditions. Metal cations may precipitate as hydroxides or form complexes

with other constituents; cations or anions may change valence states under certain reducing or oxidizing conditions; other constituents may dissolve or volatilize with the passage of time; and metal cations may also adsorb onto surfaces (glass, plastic, quartz, *etc.*). Biological changes taking place in a sample may change the valence of an element or a radical to a different valence. Soluble constituents may be converted to organically bound materials in cell structures, or cell lysis may result in release of cellular material into solution. The well known nitrogen and phosphorus cycles are examples of biological influence on sample composition. Therefore, as a general rule, it is best to analyze the samples as soon as possible after collection. This is especially true when the analyte concentration is expected to be in the low ug/l range.

Methods of preservation are relatively limited and are intended generally to (1) retard biological action, (2) retard hydrolysis of chemical compounds and complexes, (3) reduce volatility of constituents, and (4) reduce absorption effects. Preservation methods not outlined below are generally limited to pH control, chemical addition, refrigeration, and freezing.

IV. Guidelines

All Samples

With few exceptions, most samples need to be cooled to between 4-6 ^{o}C immediately after sample collection.

Preserving Aqueous Volatile Organic Compound (VOC) Samples

Equipment

Field personnel should take the following materials for VOC sample preservation to the sampling locations:

1. One 40-mL VOA vial containing 1:1 HCl.

   The 1:1 HCl should be transferred on site from a 1-liter plastic-coated glass bottle to one properly labeled 40-mL glass vial by using a glass funnel. This should be performed at the field office. Hand and eye protection must be worn during the transfer and handling of hydrochloric acid. Field personnel must attempt to keep the 40 ml vial in an upright position during field sampling. The 1-liter plastic-coated bottle must be kept at the field office; the 40-mL vial must be kept in a plastic ziplock bag.
2. Plastic ziplock bag containing pH indicator strips for each sampling location.
3. Latex gloves
4. Eye protection
5. Plastic ziplock bag for disposal of used pH indicator strips and latex gloves.

Preservation Procedures

1. For each different type of aqueous sample to be collected (*e.g.*, river sample, CSO sample) a test sample must be preserved to determine if the preservation procedure will cause an adverse reaction. Note that a test vial must also be collected when the temperature changes (*e.g.*, each season) and whenever a sample is significantly different in appearance than the test sample.

First, fill a test vial one-half full with the sample matrix to be collected. Note the color and clarity of the sample.

2. Test the pH by inserting one pH paper strip into the test vial. If the pH is less than 2.0, as indicated by a blue color on the strip, collect the samples without acidifying. Document this in the field application. The field sample management officer must document the sample as not preserved on the COC. If the pH is greater than 2.0, continue to Step 3. The pH indicator paper strip should be put into a plastic bag for later disposal.
3. Dispense 10 drops of 1:1 HCl from the pipet. Tap the vial gently to mix. If color develops, precipitates form, effervescing occurs, or an exothermic reaction (heat generation determined by holding the vial firmly) occurs, do not acidify the samples and document the reason for not acidifying in the field application. This information should also be included on the COC. If none adverse reactions occur when acid is added to the sample, proceed to Step 4.
4. Test the pH of the sample. If the pH is less than 2.0, proceed to Step 5. If the pH is greater than 2.0, add 1:1 HCl a few drops at a time (keeping count) until the pH is less than 2.0; then proceed to Step 5.
5. Fill the test vial with sample until the vial is nearly full to the top. Gently tap the side of the vial to mix, and test the pH of the sample. If the pH is less than 2.0 proceed to the next step. If the pH is greater than 2.0, again add 1:1 HCl a few drops at a time (keeping count) until the pH falls below 2.0. Proceed to the next step.
6. Note the amount of 1:1 HCl added to the test vial. Add this amount of 1:1 HCl to all of the samples, using the same glass pipet, after collecting the samples, and before capping the 40 ml vials. To avoid cross contamination, the sampler must be extremely cautious not to touch the glass pipet to the sides of the vial or the sample. Document the approximate quantity of 1:1 HCl added to each sample. These samples are then packaged and cooled to 4^0C prior to shipping to the CLP laboratory.
7. Store the samples at 4^0C until the time of analysis.
8. Properly dispose of the test vials and all used sample preservation equipment.

Preserving Aqueous Inorganic Samples with Acid

1. Add the acid to the sample using a pipette. Typically, depending on the size of the pipette and the original pH of the sample, approximately ½ a pipette of acid is required per liter of sample. Recap the sample bottle and turn it gently upside down to mix the contents.
2. Check the pH by pouring an aliquot of the sample over the pH paper; do no dip the pH paper directly into the sample. The pH of the sample should be < 2.
3. If the sample contains a significant particulate fraction, acidification without filtration could result in deceptively high values for the aqueous sample. Varying amounts of particulate matter can also give large differences in metal values for duplicate acidified aqueous samples. Observation, therefore, should be made and recorded in the field application and also noted on the COC. If an obvious change is observed during sample preservation, which may bias the results, the Site Quality Control Officer (SQO) should be consulted.
3. If the pH is still > 2, repeat steps 1 and 2 until the pH is < 2.
4. Store the samples at 4^0C until the time of analysis.

Preserving Aqueous Cyanide Samples

1. Test a drop of sample with potassium iodide-starch test paper (KI-starch paper). A resulting blue color indicates the presence of oxidizing agents and the need for treatment. Add ascorbic acid, a few crystals at a time, until a drop of sample produces no color on the indicator paper. Then add an additional 0.6 g of ascorbic acid for each liter of sample volume.
2. Add NaOH to the sample using a pipette. Typically, depending on the original pH of the sample, approximately 2 mL of NaOH per liter of sample is required. Recap the sample bottle and turn it gently upside down to mix the contents.
3. Check the pH by pouring an aliquot of the sample over the pH paper; do not dip the pH paper directly into the sample. The pH of the sample should be > 12.
4. If the pH is still < 12, repeat steps 2 and 3 until the pH I > 12.
5. Store the samples at 4^0C until the time of analysis.

Refer to the sample preservation tables (3-1 to 3-6) in the QAPP for specific sample preservation requirements.

Attachment 6

Sample Receipt Checklist

Example Sample Receipt Checklist
Lower Passaic River Restoration Project

LIMS#:_____

Project:_____ Date Received:_____

Number of Coolers:_____

USE OTHER SIDE OF THIS FORM TO NOTE DETAILS CONCERNING CHECK-IN PROBLEMS

A. Preliminary Examination Phase: Date cooler was opened:_____

Person Opening Cooler: *Printed Name:*_____ *Signature:*_____

1. Did the cooler come with an airbill?…… YES NO

   If yes, enter the Carrier Name and airbill number:_____

2. Were custody seals located on the outside of the cooler?……..…… YES NO

   If yes, how many and where were they located?_____

   If yes, were they signed and dated?_____ Date on the custody seals?_____

3. Were custody seals unbroken and intact upon arrival to the laboratory?…… YES NO
4. Was the COC sealed in a ziplock bag and taped to the inside of the cooler?……. YES NO
5. Was the COC filled out properly?……...… YES NO
6. Did the laboratory representative sign the COC in the appropriate place?…….…… YES NO
7. If required, were the samples cooled to the proper temperature with ice?…..…… YES NO

   If yes, what was the cooler(s) temperature(s) upon receipt?_____

B. Log-in Phase: Date cooler was logged-in:_____

Person Logging-in Cooler: *Printed Name:*_____ *Signature:*_____

8. What type of packing material was in the cooler?_____
9. Were all the bottles (except VOCs) sealed in separate ziplock bags?…….. YES NO
10. Did all the bottles arrive unbroken and were the labels legible?……..… YES NO
11. Did the bottle labels agree with the COC?…….……...… YES NO
12. Were the correct sample containers used for the analyses requested?……..… YES NO
13. Were the correct preservatives added to the samples?……..… YES NO
14. Was a sufficient amount of sample sent for the analyses requested?…… YES NO
15. Were any problems with the samples discovered?……...… YES NO

    If yes, was the site manager called?……..… YES NO

    If yes, prepare a telephone log and attach to this form.

Attachment 7

Cape Technologies Technical Note: TN-004 Immunoassay Dioxin

CAPE Technologies

DRAFT

High Performance Dioxin/Furan Immunoassay Kit

Technical Note TN-004

Quantitation, Calibration, and Quality Assurance for Method 4025m

Quantitation: Dioxin/furan analysis by US EPA Method 4025m using the CAPE Technologies DF1 Immunoassay Kit gives quantitative results which correlate with TEQ (per Application Note AN-008). However, just as with conventional chemical analysis, proper calibration and quality assurance are required for maximum reliability.

The DF1 immunoassay is inherently quantitative. Each immunoassay run should include 2378-TCDD standards to define a standard curve as described in Section D (Table 1) of the kit insert IN-DF1. This curve is applied to unknowns using Calculation Module C, a special purpose Microsoft Excel file available from the CAPE Technologies web site (www.cape-tech.com). Module C uses an iterative non-linear curve fitting procedure based on the same four parameter equation which is the basis for a variety of commercial immunoassay data analysis software. Module C calculates the best fit standard curve and the concentrations of unknowns based on that curve. Background information and instructions are included with Calculation Module C.

The process described above produces raw quantitative results based on the standard curve, which may or may not be an acceptable endpoint. If the analyst's goal is relative quantitation (i.e. looking for hot spots- finding deviations from a certain baseline and estimating their concentration relative to that baseline), then no calibration adjustment is required. However, if the goal is absolute quantitation (as for virtually all dioxin analysis by GC-MS), then a calibration adjustment must be applied to the raw quantitative results. Calculation Module C has this calibration adjustment calculation built in, but the analyst must determine the actual calibration adjustment factor (CAF) and provide the QA data supporting its use.

Calibration of other 4000 series methods: In order to articulate the rationale supporting this calibration adjustment, it is helpful to first describe the approach to calibration for the other 4000 series immunoassay methods approved by the US EPA (www.epa.gov/epaoswer/hazwaste/test/4_series.htm). These methods, such as Method 4020 for PCBs, have a calibration adjustment built into the method. This adjustment is determined by the kit manufacturer and is applied on the front end, through the use of immunoassay calibrators instead of standards. These calibrators are designed to let the analyst make semi-quantitative decisions at pre-selected levels, such as 1, 5, 10, or 50 µg/g. Once the kit user compares the sample to a calibrator in the same run and makes a decision, no further data interpretation is required. The calibration rationale assumes that the samples to be analyzed and the decision levels to be used are the same as those used for the validation study.

The actual concentrations of these calibrators may differ from the decision level by a factor of two or more. For example, users of one of the Method 4020 PCB kits would make a decision on whether the sample PCB level is less than 10 µg/g by comparing it to a calibrator in the same run that actually contains 5 µg/g PCB. This difference between decision level and actual concentration used for the calibrator is determined by splitting samples and analyzing by both the conventional method and the immunoassay, in quantitative mode and with no adjustment of the data. The resulting quantitative relationship between the two data sets is used to set the calibrator level so that a minimum false negative rate is achieved in the semi-quantitative decision making process.

There are several good reasons why these quantitative results from the two methods might not follow a 1:1 relationship (regression line slope of 1), even if the correlation is excellent. These include, but are not limited to, reduced efficiency of the rapid extraction method, effects of differences in congener profile between the PCB in the sample and standard, and random variation. The front end calibration procedure described above allows compensation for all such factors together, without explicitly determining their individual contributions. The calibration adjustment described above is effectively the same as obtaining unadjusted quantivative results, then multiplying them by a uniform adjustment factor. The approach to calibration for Method 4025m is similar and accomplishes the same goal, but with some very important differences. The rationale for this approach is described below.

Calibration rationale and procedure for Method 4025m: The same factors noted above which can cause the regression line slope to be less than 1 must also be dealt with when calibrating Method 4025m. However, there are more potential factors because of the increased complexity of the procedure (e.g. recovery through cleanup and solvent exchange as well as extraction) and because of the greater variability of the analyte composition (congener profile) among the population of possible samples. For these and other reasons, the front end calibration approach described above for other 4000 series immunoassays is not viable for Method 4025m. Therefore Method 4025m analysis uses standards rather than calibrators, and the analyst applies a back end calibration adjustment to the raw quantitative results.

The calibration procedure supported by the above rationale is straightforward. A set of split samples is analyzed by the reference method (GC-MS) and also by Method 4025m. The comparison data set will likely have some deviation from the ideal 1:1 relationship noted above (regression line slope other than 1). A new data set of adjusted 4025m results is created by multiplying each raw 4025m result by the CAF (starting at 1). The CAF is then changed and the regression line slope is calculated for the adjusted 4025m data. The final CAF value is that which gives a regression line slope of 1 for the adjusted 4025m data. This CAF is then uniformly applied to all raw 4025m results. Once a CAF is determined, it should be checked and refined continuously using the stream of GC-MS data from ongoing quality assurance samples. On a larger project, from 5 to 20 percent of samples screened by Method 4025m should be split for conventional analysis. These are the most important quality assurance samples, but are by no means the only ones that should be run.

Notes on calibration quality: For best results, calibration adjustment should be done on a site specific basis if possible. Differences in dioxin source, sample matrix, and congener profile will all increase the variability of quantitative results and decrease the probability of success. The effect of congener profile on calibration can be estimated in advance using Calculation Module A. More samples will obviously give better results. It is theoretically possible to base a CAF on a single sample, but statistically unwise. Likewise, it is statistically best for the samples on which the CAF is based to cover as wide a concentration range as possible.

The closer the calibration samples are to the target sample population, the better the calibration adjustment will be. It is possible to use other reference samples for calibration, but the results will not be as good as when using samples from the same set as the unknowns. For example, calibration based solely on spiked samples can be used, but is less than ideal, since it will not account for extraction differences between spikes and incurred residues. Likewise, calibration based solely on unrelated samples, such as standard reference materials, will not account for matrix differences between the reference sample and the unknown samples.

Attachment 8

Cape Technologies Technical Note: TN-005 PCB Immunoassay

CAPE Technologies

DRAFT

High Performance PCB-TEQ Immunoassay Kit (PCB1)
High Performance Dioxin/Furan Immunoassay Kit (DF1)

Technical Note TN-005

Preparation of Samples for PCB-TEQ Analysis Using Carbon Column Fractionation

Existing Carbon Column Method: The preparation of samples for dioxin/furan analysis by US EPA Method 4025m is described in CAPE Technologies Application Note AN-008. This method uses a two stage coupled column system for cleanup of an extract in an aliphatic solvent (such as hexane or hexane/tetradecane). The second stage of this cleanup is an activated carbon mini-column which is used to capture the dioxin/furan portion of the sample for analysis with the DF1 Immunoassay Kit. The protocol described in Application Note AN-008 calls for loading the sample onto the carbon mini-column, washing with 6 mL of 1:1 hexane:toluene in the forward direction, then reversing the column to elute the dioxin/furan sample with 12 mL of toluene. It is very simple to modify this protocol to allow capture of the dioxin-like PCB fraction from the same sample.

Fractionation Protocol: The protocol modification noted above is as follows:

1) after removing the carbon column from its acid silica column during the sample loading (step F7/8), the column is placed on a clean empty reservoir for washing of the carbon column alone (as in the first portion of AN-008 step F9)
2) the column is washed in the forward direction with 5 mL hexane (new step)
3) the dioxin-like PCB fraction is eluted in the forward direction with 6 mL of 1:1 hexane:toluene and captured for analysis (exactly as in AN-008 step F9, except that the eluate is captured here)
4) if analysis of the dioxin/furan fraction is required, continue as normal in AN-008 (step 10); reverse elute with 12 mL toluene to obtain the dioxin/furan fraction

Analysis of Eluted PCB's: The captured dioxin-like PCB fraction is exchanged for immunoassay analysis using the same protocol as described for dioxin/furan analysis. An aliqout of immunoassay keeper is added and the sample is evaporated under a nitrogen stream with gentle heating. The residue is centrifuged and methanol is added to dilute the sample prior to addition to the immunoassay tube. The complete PCB immunoassay analysis procedure is described in detail in the PCB-TEQ Kit Insert (IN-PCB1).

Supporting Data: The original design of the carbon column method in AN-008 was intended to remove as many potentially interfering compounds as possible from the dioxin/furan sample. The protocol as outlined in AN-008 captures in the dioxin/furan fraction all the tetra- and higher chlorinated PCDD's and PCDF's which contribute to the TEQ and are detected by the DF1 immunoassay. The preceding hexane:toluene fraction described above contains the major crossreacting PCDD/F, 237-triCDD, as well as the 12 WHO dioxin-like PCBs. Other PCBs are flushed through the carbon column during the hexane washes before and after the carbon column is removed from the acid silica column, before the hexane:toluene fraction. This carbon column elution behavior has been verified using stable isotope labeled dioxin/furan and PCB congeners, analyzed by HRMS.

The CAPE Technologies PCB-TEQ Immunoassay and the fractionation protocol described above were evaluated in a 2004 demonstration project as part of the Superfund Innovative Technology Evaluation (SITE) Program. The final report is not public yet, but will be released in 2005. The EPA concluded that the PCB-TEQ kit, with the cleanup method described above, could be an effective screeing procedure for PCB TEQ. These data will be released to CAPE Technologies customers concurrent with the release of the final SITE Program Demonstration report.

Parallel Analysis of TEQ from PCDD/Fs and PCB's: The carbon column fractionation described here allows a single sample to be extracted and prepared for immunoassay analysis using both the DF1 Dioxin/Furan Kit and the PCB1 PCB-TEQ Kit. The resulting data can be combined to give a total TEQ value from PCDD/F's and PCB's, as well as defining the relative contributions of the two components. The amount of time required for this combined analysis is only marginally greater than for either analysis alone. In addition to the "piggybacked" sample preparation by carbon column fractionation, the immunoassays can be run concurrently, with slightly staggered incubation times. The potential economic and scientific benefit of this approach for assessment of either unknown sites or known PCB/dioxin sites is huge.

Attachment 9

Memorandum on Security of Field Applications

Memo

Date: 07/24/2003

To: Alice Yeh, Bruce Fidler, Rob Danowski, Ertan Akbas

From: Lisa Szegedi-Greco

RE: Security on the Field Application - Revised

The Passaic River Estuary Superfund Site consists of approximately 17 miles of the Passaic River from its mouth at Newark Bay upstream to the Dundee Dam. The study area for the site also includes the Hackensack River from its mouth upstream to the Oradell Dam, Berry's Creek, Pierson Creek, portions of Newark Bay, the Kill van Kill and the Arthur Kill. Currently, it is anticipated that sampling will begin in the study area within the next year. Due to the complexities of the site (i.e., the number of potentially responsible parties [PRPs] and trustees that are involved, the magnitude of the sampling event [i.e., thousands of surface water, sediment, and biota samples, being analyzed by numerous laboratories for a large suite of parameters], the speed at which the work will take place) it is imperative that an appropriate system should be implemented to assure that the field data collected are accurate, complete, and legally defensible. The magnitude and complexity of the sampling program would render impractical the use of traditional field data collection methods (i.e., handwritten field logbooks and data sheets). A more efficient solution that would increase the quality of the data, greatly reduce transcription errors, and allow multiple team members at various locations access to the data, is to collect and control the field data electronically. The purpose of this memo is to summarize the innovative electronic field data collection and control methods already being used by Malcolm Pirnie on behalf of USEPA and the Kansas City District at another Superfund Site to facilitate determination as to whether the system is sufficiently secure for the purposes of the Passaic River project.

Data collection occurs on a Visual Basic application (developed in-house) (with an MS Access database) that is downloaded onto a field laptop computer. The following section summarizes data collection from the field to the project website:

1. First, a secure project website is established. Security on the website consists of secure socket layers (i.e., https site), password protection, and multiple user levels. These user levels restrict access and rights to certain portions of the website. For the Passaic River project, this electronic access security would be supplemented by the existing confidentiality / non-disclosure agreements which would discourage system users from distributing their usernames or passwords to others outside the approved team. The system could also be set up to require periodic password changes.

2. Next, information needed for the field is entered onto selected pages of the website. For example, all of the field instruments (e.g., Horiba, photoionization detector (PID)) are assigned a unique barcode identifier. Information for the equipment (e.g., model, calibration date) is then entered into the project website on the equipment page.

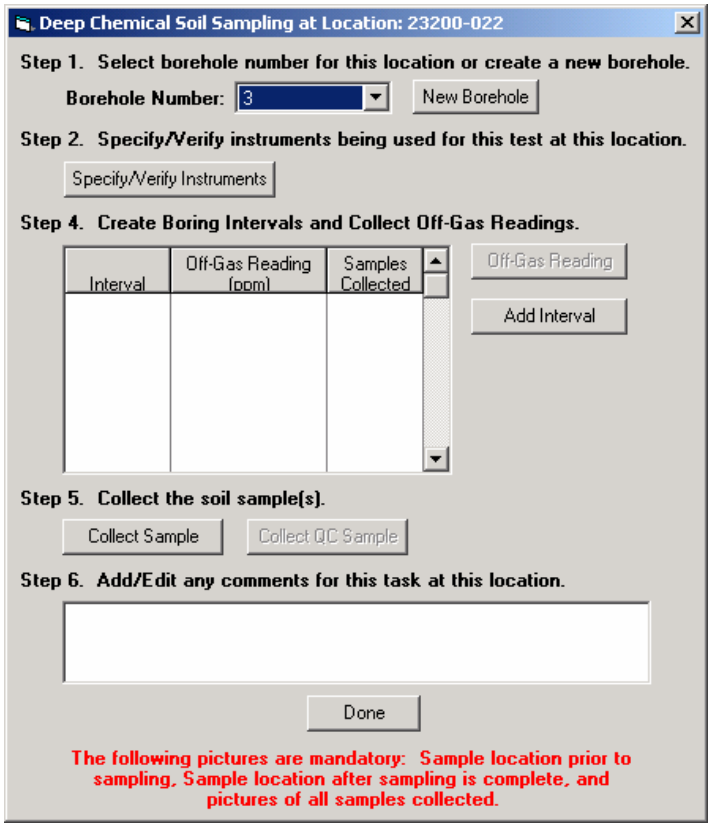
3. A calendar of field events (with a comments section) is created to assist the field team(s) with their work, and to ensure that all teams know and understand their sampling assignments. Work orders that specify where sampling is to occur, what parameters should be analyzed for, as well as any other pertinent information, are also created in the calendar.

4. When the field team(s) begins work, each team is assigned a field laptop that has a specific identification number associated with it. When the field team launches the field application the user is prompted for

their unique username and password. This way, the field application keeps a log of who entered in what information, along with the dates and times the information was entered. The purpose of this is twofold; this acts as each field team member's electronic signature and it also ensures that unauthorized users cannot access the software (i.e., write in someone else's logbook).

5. At the beginning of each new sampling event, the field team downloads a work order, that is specific to that field team, from the project website to the field laptop. The work order contains that crew's field assignment (e.g., chemical sediment sampling in the Passaic River between river miles 2.0 and 3.0), as well as information about previous sampling that occurred at this location. Each week, the field team also updates the background information associated with each work order (e.g., equipment IDs) by downloading this information from the website.

6. When the field team begins collecting sampling information, they are required to fill in a series of information windows (see example below) that consist of pick lists, comments fields, and automatically generated fields. For example, if a field team is collecting a chemical sediment sample, the field application, *not the field team*, assigns the sample ID. Since the sample ID also contains the unique identifier for the laptop from which it was requested, sample IDs are never duplicated. Another advantage is the elimination of missing information since certain fields must be filled in prior to moving to another window.



7. After the field team completes an information window and clicks the button labeled "Done," the information entered into the window can be viewed but it cannot be changed. This is analogous to the field team not being allowed to erase information once it's entered into the field logbook.

8. All the information collected in this application is written to a secure password-protected MS Access database accessible directly only by a database administrator. Since the database is secure, the field team is not able to make any changes to the records contained in it.

9. After all sample collection is complete, the field team returns to the field office to upload the information to the project website. The field team then prints out the field data collection report from the website, reviews the report, and initials and dates each page. Copies of this report are kept at the site field office under the field team leader's control

10. Once the information is on the website it is reviewed by the Site Quality Control Officer (QCO) or his/her designee. They can either accept or reject each piece of data. During this review and/or the field team's review of the report, it is possible that mistakes or omissions in the information will be noted. When this occurs, the field team is supplied with a paper form to fill out that requests either supplemental information or corrections to the data. This information is then added to the report by one of the site administrators. A complete paper record of the change and/or addition, the person requesting the correction, the person supplying the information, and the date of the change, is maintained in the site files.

Advantages of this system over traditional data collection and control methods include the following:

1. Field data are typically available for review within hours after being collected. Once the data are uploaded to the web site, any member of the project team can view the data in a standardized report format that lists the geographic location for each sample or measurement, any associated quality control, all instrument measurements and response checks, and what type of laboratory sample was collected.

2. Collecting data with this system greatly improves the quality of the data since it nearly eliminates data omissions, reduces the amount of transcription errors, and automates some field quality control (QC). The field application prompts the field team to collect QC samples (duplicates, matrix spikes (MS), matrix spike duplicates (MSD), matrix duplicates (MD), and rinsates) and it also does not allow certain incorrect information to even be entered. When using a traditional logbook, there are no checks on the information that is entered, which can result in missing or incomplete data. Given this, the data evaluation team might not discover that information was missing until several weeks after the field work was completed. At that point, recapturing the information could be costly, if not impossible. In the application it is nearly impossible to omit essential information since certain fields are mandatory and the data collection team cannot proceed through the application without completing them.

3. Instrument QC is entered directly into the system at the beginning and end of each day. If the response check indicates that the instrument is not working properly (e.g., the PID response is greater than 2 parts per million different from the standard gas concentration), the user is prompted to use a different instrument. This allows the field team to immediately identify if a problem is occurring, thus eliminating wasted field effort.

4. Quality control calculations are also built into the system. For example, when the field team collects a duplicate measurement with an instrument, the field application will calculate the relative percent difference and determine if it falls within the required limits. If not, a message will appear on the screen warning the user to check the instrument. This function virtually eliminates wasted field effort due to malfunctioning instruments.

As described above, once the field data are collected, the information is uploaded from the field application to the project website. A module on the website allows the field team to select individual samples, create chain of custody forms, and mark the samples as shipped to the laboratory. Each chain of custody form is retained electronically on the system; a signed hard copy of the form is also retained in the site files, under control of the field team leader. Once the laboratory receives the samples, a module on the website allows them to mark each shipment as received. Any problems with the shipment such as broken custody seals or insufficient sample volume, are also marked on the website.

Attachment 10

SOP No. 12 Technical System Audit

Title: Procedure to Conduct a Technical System Audit (TSA)

I. Introduction

This guideline is to provide information on TSAs to be conducted for the Lower Passaic River Restoration Project.

II. Guidelines

The purpose of the TSA is to ensure that the sampling team adheres to the guidelines contained in the Work Plan, Field Sampling Plan (FSP), and Quality Assurance Project Plan (QAPP). Prior to conducting the audit, a copy of the Final Work Plan, FSP, and QAPP will be reviewed by the auditor (QC Officer or designee). During the TSA the sampling team's adherence to these guidelines will be verified and any deficiencies from the guidelines will be documented. The effect of the deficiencies will be noted, and any necessary corrective actions will be instituted.

Prior to conducting the audit, the auditor will contact the Deputy Project Manager to discuss the audit. This will ensure that the sampling team is properly prepared for the sampling event.

A. Conducting the TSA

The following procedures will be used to conduct the TSA:

1) The auditor will bring the following equipment/documents into the field:

- Copy of the Final Work Plan, FSP, and QAPP, and any relevant memos, correspondence or addenda
- Field laptop
- TSA audit checklist
- Digital camera

2) The following aspects of the sampling event will be audited:

- QA/QC samples
- Sampling methodologies
- Field documentation, including photographs
- Sample management tasks
- Decontamination procedures

B. Corrective Action in the Field

Besides observing and reporting, the auditor is responsible for initiating steps for the start-up of corrective action procedures.

If the auditor witnesses discrepancies in the field between the Final Work Plan, FSP, and QAPP and the performance of the sampling team, the auditor has several options available for corrective action. These options are dependent upon the type of deficiencies observed.

Deficiencies observed and the corrective action taken must be documented in the auditor's log book.

- Minor Deficiencies

  Minor deficiencies are problems where the impact, if any, to the data can be easily eliminated and the deficiency can be corrected or the procedure repeated to achieve the desired result. Minor deficiencies that are observed by the auditor will immediately be brought to the attention of the field team. The auditor and the field team will discuss the problem and agree upon what corrective action is necessary. This will allow for the deficiencies to be corrected immediately in the field.

- Major Deficiencies

  Major deficiencies are events or procedures that substantially deviate from approved work plans, will result in increased project costs not previously approved, or will significantly impact the quality of the data.

  Upon witnessing a major deficiency, the auditor will temporarily stop all related site work and will inform the field team of the problem. The auditor and field team will discuss the deficiency as well as what steps are necessary for corrective action. If the deficiency can be corrected in the field, the auditor may allow work to resume as long as all necessary corrective actions are taken. Information regarding the nature of the deficiency as well as the corrective action(s) taken will immediately be transmitted to the USACE PM, the Malcolm Pirnie Project Manager, and the Deputy Project Manager.

If the deficiency cannot be corrected in the field, a Stop-Work Order will be issued until appropriate measures can be taken to correct the problem. A written report of the major deficiencies will be prepared by the Site QC Officer and submitted to the USACE PM, the Malcolm Pirnie Project Manager, and the Deputy Project Manager. The Stop-Work Order will remain in effect until the proper corrective action(s) can be implemented.

C. Preparation of a TSA Report

The TSA report provides a means of relaying the events of a sampling episode to key personnel. These events could possibly affect the sample integrity (QA/QC) and therefore, are important to the decisions made regarding analytical data. This report will identify any deficiencies found in the field and will outline the corrective actions that were recommended/implemented to address any minor deficiencies observed. The field audit report will also recommend appropriate corrective actions for any major deficiency noted. Follow-up reports describing completed corrective actions which addressed major deficiencies will be submitted by the Project Manager to the USACE PM.

A quality control field audit report will usually contain the following information:

- Date and location of field audit
- Sample matrices witnessed
- Name of personnel conducting the sampling
- Summary of sample methodology
- Description of any infractions that occurred and the corrective actions taken
- Conclusions
- Recommendations
- Quality control field audit checklist

QUALITY CONTROL FIELD AUDIT REPORT

SUMMARY INFORMATION

1. PROJECT NAME: _____

2. PROJECT ADDRESS: _____

_____

_____

3. PRELIMINARY ASSESSMENT _____ RI/FS _____ RD _____ CONSTRUCTION_____

OTHER _____

4. DATE(S) OF QC FIELD AUDIT _____

5. AUDITOR'S NAME _____PHONE_____

6. FACILITY CONTACT _____PHONE_____

7. CONTRACTOR CONTACT_____PHONE_____

8. PERSONNEL ON-SITE

NAME	REPRESENTING	PHONE
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

9. AUDITOR'S COMMENTS

_____

_____

_____

_____

10. WEATHER CONDITIONS

SUNNY ; PARTLY SUNNY ; PARTLY CLOUDY ; CLOUDY ; RAIN ; DRIZZLE ; SNOW ; SLEET

TEMPERATURE_____ WIND SPEED_____ WIND DIRECTION_____

11. LEVEL OF PERSONNEL PROTECTION REQUIRED IN WORK PLAN

A B C D

LEVEL OF PERSONNEL PROTECTION ACTUALLY DONNED:

A B C D

12. FIELD SURVEY EQUIPMENT

INSTRUMENT	MODEL	CALIBRATION CHECK	CALIBRATION STANDARD	SPAN SETTING
CONDUCTIVITY METER	_____	_____	_____	_____
DISSOLVED O_2 METER	_____	_____	_____	_____
PH METER	_____	_____	_____	_____
COMBUSTIBLE GAS INDICATOR (LEL/O_2)	_____	_____	_____	_____
FLAME IONIZATION DETECTOR (OVA)	_____	_____	_____	_____
PHOTOIONIZATION DETECTOR (HNU)	_____	_____	_____	_____
TOTAL GAS INDICATOR (CO,H_2S)	_____	_____	_____	_____
OTHER	_____	_____	_____	_____

OBSERVATIONS _____

_____

_____

13. DID THE SAMPLING TEAM TAKE PERIODIC SURVEYS OF THE AMBIENT AIR CONDITIONS?

YES NO N/A

14. DID THE SAMPLING TEAM PROVIDE A DECON ZONE DESIGNATING CLEAN AND CONTAMINATED AREAS?

YES NO N/A

15. WERE PHOTOGRAPHS TAKEN? YES NO

16. AUDITOR'S COMMENTS

_____

_____

_____

MONITORING WELL SAMPLING SETUP AND EVACUATION

EVACUATION PROCEDURES

1. WELL CASING CONSTRUCTION STAINLESS STEEL TEFLON PVC OTHER _____

2. DIAMETER OF WELL CASING 2" 4" 6" OTHER _____

3. LOCKING CAPS ON THE WELLS? YES NO N/A PROTECTIVE CASING? YES NO N/A

4. METHOD UTILIZED TO DETERMINE THE STATIC WATER LEVEL

WATER LEVEL INDICATOR OTHER _____

5. REFERENCE POINT THAT THE STATIC WATER LEVEL WAS MEASURED FROM:

SURVEY POINT	TOP OF INNER CASING	TOP OF PROTECTIVE CASING	HEIGHT OF CASING ABOVE GROUND SURFACE

6. WAS THE WATER LEVEL INDICATOR DECONTAMINATED ACCORDING TO STANDARD PROCEDURES BETWEEN EACH WELL?
YES NO N/A

IF NO, METHOD USED: _____

_____

_____

7. EVACUATION METHOD:

BAILER CENTRIFUGAL PUMP PERISTALTIC PUMP BLADDER PUMP SUBMERSIBLE PUMP

GAS DISPLACEMENT PUMP GAS LIFT PUMP OTHER _____

8. TYPE OF HOSE UTILIZED:

POLYETHYLENE TEFLON SILASTIC N/A OTHER _____

9. WAS THE HOSE DEDICATED TO EACH WELL LOCATION? YES NO N/A

IF NO, METHOD OF DECONTAMINATION _____

10. WAS THE PUMP DEDICATED TO EACH WELL LOCATION? YES NO N/A

11. WAS THE PUMP: LABORATORY DECONTAMINATED? FIELD DECONTAMINATED? N/A

12. WAS THE PUMP DECONTAMINATED ACCORDING TO STANDARD PROCEDURES?

YES NO IF NO, METHOD OF DECONTAMINATION _____

13. WAS THE PUMP HEAD OR END OF HOSE WITHIN 6 FEET OF THE DYNAMIC WATER LEVEL DURING EVACUATION?
YES NO N/A

14. WAS THE DECONTAMINATION AREA LOCATED AWAY FROM THE SOURCE OF CONTAMINATION?

YES NO N/A

15. AUDITOR'S COMMENTS

_____

_____

_____

AQUEOUS SAMPLING PROCEDURES

1. AQUEOUS MATRIX SAMPLED:

POTABLE WELL GROUND WATER SURFACE WATER LEACHATE RUNOFF STORM SEWER

SANITARY SEWER OTHER _____

2. TYPE OF SAMPLE: GRAB COMPOSITE IF COMPOSITE - SAMPLES/COMPOSITE _____

3. WAS THE VOA SAMPLE COLLECTED FIRST? YES NO N/A

4. TYPE OF SAMPLING EQUIPMENT:

	MATERIAL OF CONSTRUCTION			
	STAINLESS STEEL	TEFLON	GLASS	OTHER
BAILER	_____	_____	_____	_____
BLADDER PUMP	_____	_____	_____	_____
SAMPLER	_____	_____	_____	_____
COLIWASA	_____	_____	_____	_____
KEMMERER DEPTH SAMPLER	_____	_____	_____	_____
WHEATON DIP SAMPLER	_____	_____	_____	_____
TUB SAMPLER	_____	_____	_____	_____
BACON BOMB	_____	_____	_____	_____

5. TYPE OF LEADER LINE THAT COMES IN CONTACT WITH THE WELL WATER:

TEFLON TEFLON COATED STAINLESS STEEL N/A OTHER _____

6. LENGTH OF THE LEADER LINE _____

7. WAS THE SAMPLING EQUIPMENT DEDICATED? YES _____ NO _____

8. WAS THE SAMPLING EQUIPMENT: LAB DECONTAMINATED? FIELD DECONTAMINATED?

9. WAS THE SAMPLING EQUIPMENT DECONTAMINATED ACCORDING TO STANDARD PROCEDURES?

YES NO IF NO, METHOD OF DECONTAMINATION: _____

10. WAS THE DECONTAMINATION AREA LOCATED AWAY FROM THE SOURCE OF CONTAMINATION?

YES NO

11. ARE DISPOSABLE GLOVES WORN AND CHANGED BETWEEN EACH SAMPLE LOCATION? YES NO

12. AUDITOR'S COMMENTS:

_____

_____

_____

NON-AQUEOUS SAMPLE INFORMATION

1. NON-AQUEOUS MATRIX SAMPLED:

SOIL SEDIMENT SLUDGE CHEMICAL SOLIDS WASTE PILE

OTHER _____

2. TYPE OF SAMPLE: GRAB COMPOSITE IF COMPOSITE - SAMPLES/COMPOSITE _____

3. WAS THE VOA SAMPLE COLLECTED FIRST FROM A DISCRETE LOCATION PRIOR TO HOMOGENIZATION?

YES NO N/A

4. WAS THE SAMPLE HOMOGENIZED PRIOR TO ACQUISITION INTO THE SAMPLE CONTAINERS? YESNO

5. TYPE OF SAMPLING EQUIPMENT:

	MATERIAL OF CONSTRUCTION			
	STAINLESS STEEL	TEFLON	GLASS	OTHER
SPOON/SPATULA	_____	_____	_____	_____
TROWEL/SCOOP	_____	_____	_____	_____
BUCKET AUGER	_____	_____	_____	_____
SPLIT SPOON	_____	_____	_____	_____
SHELBY TUBE	_____	_____	_____	_____
TRIER	_____	_____	_____	_____
PONAR DREDGE	_____	_____	_____	_____

6. WAS THE DRILL RIG, AUGER FLIGHTS, RODS, ETC. DECONTAMINATED ACCORDING TO STANDARD PROCEDURES BETWEEN EACH SAMPLE LOCATION? YES NO N/A

IF NO, METHOD OF DECONTAMINATION _____

7. IF MUD ROTARY DRILLING WAS UTILIZED WHAT WAS THE SOURCE OF THE WATER? _____

8. WAS THE SAMPLING EQUIPMENT DEDICATED? YES_____ NO _____

9. WAS THE SAMPLING EQUIPMENT: LAB DECONTAMINATED? FIELD DECONTAMINATED?

10. WAS THE SAMPLING EQUIPMENT DECONTAMINATED ACCORDING TO STANDARD PROCEDURES?

YES NO IF NO, METHOD OF DECONTAMINATION: _____

11. WAS THE DECONTAMINATION AREA LOCATED AWAY FROM THE SOURCE OF CONTAMINATION? YES NO N/A

12. ARE DISPOSABLE GLOVES WORN AND CHANGED BETWEEN EACH SAMPLE LOCATION? YES NO N/A

13. AUDITOR'S COMMENTS

_____

_____

_____

QA/QC INFORMATION

1. LABORATORY:

NAME _____ PHONE _____

CONTACT PERSON _____

CLP CLP CAPABLE CERTIFIED OTHER _____

3. SAMPLE INFORMATION:

MATRIX	PARAMETER	PRESERVATIVE	CONTAINER DESCRIPTION
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

3. WHAT ORDER BY ANALYTICAL PARAMETER ARE SAMPLES COLLECTED: _____

_____

4. FIELD BLANKS: YES NO N/A FREQUENCY _____

METHOD: _____

WAS IDENTICAL BOTTLE TO BOTTLE TRANSFER OF WATER UTILIZED? YES NO

5. TRIP BLANKS: YES NO N/A FREQUENCY _____

6. WHAT WAS THE SOURCE OF THE BLANK WATER? LABORATORY DEMONSTRATED ANALYTE-FREE
OTHER_____

7. SAMPLE PACKAGING AND HANDLING:

SAMPLE CONTAINERS LABELED	YES	NO	N/A
COC FORMS COMPLETED	YES	NO	N/A
CUSTODY SEALS	YES	NO	N/A
SAMPLES PRESERVED TO $4^{\circ}C$:	YES	NO	N/A

8. AUDITOR'S COMMENTS

_____

_____

_____

_____

Attachment 11

Field Modification Form

FIELD MODIFICATION FORM
LOWER PASSAIC RIVER RESTORATION PROJECT

Date:

Document:

Activity:

Requested Modification:

Rationale:

Attachments:

Malcolm Pirnie Project Manager:_____

Malcolm Pirnie Deputy Project Manager: _____

Malcolm Pirnie Site QC Officer:_____